

UNIVERSIDADE FEDERAL DO PARANÁ

ITAMIR CACIATORI JUNIOR

COMPETITIVENESS OF INCUMBENT, DIGITALIZED, AND DIGITAL BANKS:
A COMPARATIVE STUDY OF FINANCIAL INNOVATION IN BRAZIL

CURITIBA

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COMPETITIVENESS OF INCUMBENT, DIGITALIZED, AND DIGITAL BANKS:
A COMPARATIVE STUDY OF FINANCIAL INNOVATION IN BRAZIL

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Orientadora: Prof.^a Dra. Ana Paula Mussi Szabo Cherobim

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“Homem feio e sem coragem não possui mulher bonita “

Gildo de Freitas

RESUMO

A indústria financeira brasileira apresenta alto nível de concentração bancária: os cinco maiores bancos detêm 69,8% dos ativos totais, operações de crédito e depósitos totais do setor bancário e não-bancário (dezembro/2019). Como consequência, o mercado opera de forma ineficiente e com tarifas e taxas de juros maiores para os clientes. Pesquisar os novos entrantes neste setor ajuda a mostrar como a concorrência e a geração e a adoção de inovações, impactam na competitividade da indústria. A literatura reconhece a indústria financeira como setor de vanguarda para novas tecnologias, que pode proporcionar o "impulso inicial" das revoluções tecnológicas. O objetivo desse trabalho é propor uma estrutura para analisar os impactos competitivos das novas empresas baseadas na inovação sobre os bancos já existentes no setor financeiro. Em face da diversidade das Fintechs, como são chamadas as empresas de tecnologia financeira, construímos um Modelo de Análise para Categorização de FinTechs, resultando em nove categorias. Para essa tese, selecionamos as Fintechs categorizadas como Bancos Digitais e Digitalizados para cotejar seus produtos e serviços aos tradicionalmente oferecidos por bancos incumbentes. Em outras palavras, pretendemos identificar os principais fatores que influenciam a substituição de produtos e serviços bancários já existentes por aqueles oferecidos por bancos digitalizados e digitais. Essas características servem de guia para analisar a competitividade entre esses agentes, à luz das teorias da organização industrial, processos de mercado e inovação em organizações. A abordagem é exploratória, por meio da metodologia de métodos mistos em três etapas (qualitativa, quantitativa e metainferência). Esta escolha metodológica considera a facilidade de acesso a informações sobre bancos incumbentes em contraposição à escassez de informações sobre bancos digitalizados e digitais. Ademais, reduz as dificuldades na obtenção de dados padronizados sobre essas empresas. Uma das conclusões qualitativas é que quando os bancos incumbentes resistem em compartilhar informações com bancos digitalizados e digitais, eles valorizam seus *sticky factors* e seus ativos invisíveis, usando a estratégia de *deep pockets*. Então, como estas empresas têm mais orçamento para investir na melhoria de sua eficiência através de novas rotinas ou adaptando as já existentes, a estratégia de *deep pockets* é uma solução viável para a maioria dos problemas, no curto prazo. A análise quantitativa nos indica que, de 15 novos produtos e serviços utilizando novas tecnologias lançadas no mercado financeiro brasileiro entre 2013 e 2019, os bancos digitais e digitalizados introduziram 11 deles (73,33%). Também verificamos que a disponibilidade de APIs e a abertura para trânsito de dados com outras empresas financeiras e não financeiras (por exemplo, lojas de varejo) são uma característica inovadora e distintiva dos bancos digitais e digitalizados. Entre as conclusões quantitativas, verificamos que os bancos estabelecidos dominam sete (pagamentos e transferências, outros, empréstimos, investimentos, seguros, câmbio e bancos digitais) entre nove categorias de produtos e serviços. Para o futuro, concluímos que o setor bancário passa por acelerada fase de transição, na qual os bancos já existentes dividem ainda mais suas atividades criando seus próprios bancos digitalizados e digitais. Esta fase de transição depende das parcerias entre bancos digitalizados e digitais e da regulamentação favorável para reduzir a concentração e os desequilíbrios de mercado, aumentando a competitividade do sistema.

Palavras-chave: bancos incumbentes; bancos digitalizados; bancos digitais; inovação financeira; competitividade.

ABSTRACT

The Brazilian financial industry has a high banking concentration level, where the five largest banks hold 69.8% of total assets, credit operations, and total deposits of the banking and non-banking sector (December/2019). Therefore, the market operates inefficiently and with higher fees and interest rates to clients. Researching new entrants in this industry helps to show how competition and the generation and adoption of innovations impact the competitiveness of the industry. The literature recognizes the financial industry as a vanguard sector for new technologies, which can provide the “initial momentum” of technological revolutions. The objective of this work is to propose a structure to analyze the competitive impacts of new innovation-based companies on incumbent banks in the financial sector. Considering the variety of Fintechs, as the companies of financial technology are called, we built an FinTechs Categorization Model of Analysis, resulting in nine categories. For this work, we selected the Fintechs categorized as Digital and Digitalized Banks to compare their products and services to those traditionally offered by incumbent banks. In other words, we intend to identify the main factors that influence the replacement of existing banking products and services by those offered by digitalized and digital banks. These characteristics serve as a guide to analyze the competitiveness among these agents, considering the theories of industrial organization, market processes and organising organizations. The approach is exploratory, using the methodology of mixed methods in three stages (qualitative, quantitative and metainference). This methodological choice considers the ease of access to information on incumbent banks as opposed to the scarcity of information on digitalized and digital banks. Furthermore, it reduces the difficulties in obtaining standardized data on these companies. One of the qualitative conclusions is that when incumbent banks resist sharing information with digitalized and digital banks, they value their sticky factors and invisible assets using the deep pockets strategy. So, as these companies have more budget to invest in improving their efficiency through new routines or adapting existing ones, the deep pockets strategy is a viable solution to most problems in the short term. The quantitative analysis indicates that out of 15 new products and services employing new technologies launched in the Brazilian financial market between 2013 and 2019, digital and digitalized banks introduced 11 of them (73.33%). We also found that the availability of APIs and the opening of data flow with other financial and non-financial companies (e.g., retail stores) are an innovative and distinctive feature of digital and digitalized banks. Among the quantitative findings, we found that the established banks dominate seven (payments and transfers, others, loans, investments, insurance, foreign exchange, and digital banks) among nine categories of products and services. Looking to the future, we conclude that the banking sector is going through an accelerated transitional stage, in which the existing banks further split their activities by creating their own digitalized and digital banks. This transition stage depends on partnerships between digitalized and digital banks and favorable regulation to reduce concentration and market imbalances, increasing the competitiveness of the system.

Keywords: Incumbent banks; digital banks; digitalized banks; financial innovation; competitiveness.

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LIST OF ACRONYMS

AAI	Agente Autônomo de Investimento
ABFintechs	Associação Brasileira de FinTechs
AI	Artificial Intelligence
ANBIMA	Associação Brasileira das Entidades dos Mercados Financeiros e de Capitais
API	Application Programming Interface
ATM	Automated Teller Machine
B2B	Business to Business
B2C	Business to Customer
BACEN	Banco Central do Brasil
BB	Banco do Brasil
BV	Banco Votorantim
CADE	Conselho Administrativo de Defesa Econômica
CNPJ	Cadastro Nacional de Pessoas Jurídicas
CVM	Comissão de Valores Mobiliários
DLT	Distributed Ledger Technology
E-MONEY	Electronic Money
FSB	Financial Stability Board
FGV	Fundação Getúlio Vargas
FIA	Fundação Instituto de Administração
GDP	Gross Domestic Product
IBGE	Instituto Brasileiro de Geografia e Estatística
IMF	International Monetary Fund
IOSCO	International Organization of Securities Commissions
IT	Information Technology
LGPD	Lei Geral de Proteção de Dados
M&A	Mergers and Acquisitions
MPME	Micro, Pequenas e Médias Empresas
NIS	National Innovation Systems
OECD	Organization for Economic Co-operation and Development
P2P	Peer-to-Peer
PS	Products and Services

POS	Point of Sale
R&D	Research and Development
R\$	Brazilian Real
RFB	Receita Federal do Brasil
SCD	Sociedade de Crédito Direto
SEP	Sociedade de Empréstimo entre Pessoas
SEPRAC	Secretaria de Promoção da Produtividade e Advocacia da Concorrência
SPRU	Science Policy Research Unit
SUSEP	Superintendência de Seguros Privados

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1 INTRODUCTION

Financial transactions are something necessary to live in society. It has been happening in world history since the creation of money. Financial markets seek to accomplish this function through companies necessary to pay, receive, invest, and borrow money. Thus, Information Technology (IT) is an essential element to implement, accelerate, and secure financial transactions.

Barras (1990) emphasize that each technological revolution starts with the vanguard sector, which will give the conditions to the most rapid initial rate of take-up of the new technology. The author adds that considering the IT revolution, financial is the vanguard sector because it combines three factors that ensure the take-up and use of new technologies: technological opportunity; market conditions, and the favorable structure of the industry¹.

A vital aspect of this technological context is financial innovation. This type of innovation is essential due to the direct positive ramifications and indirect positive effects of the financial system in the economy (Frame; White, 2004).

The potential possibility of excluding a third element from financial intermediation (e.g., a commercial bank) is an example of the effects of financial innovation in an economy. Except for direct trading in securities, the lack of similar historical situations may difficult a prospective analysis of these effects based on empirical evidence.

FinTechs are financial technology-based companies that offer financial innovations in processes, products, services, and customer relationships. Some types of FinTechs foster the possibility of excluding the third part from the market (e.g., peer-to-peer lending) or advantages to the customers due to specific elements like the intensive use of technology.

In the study of financial transactions, it is useful to differentiate between banking products and services (PS). Although the difference between PS seems to be tenuous, the first category is related to the ends that customers can acquire (e.g., insurance, lending, and investments). The services are the means available to customers to perform their banking transactions (e.g., debit cards, transfers, and checking balance).

¹ We conceptualize industry as a group of firms that deal in the same market and perform similar activities.

Arner et al. (2015) describe that three main factors contributed to the emergence and evolution of FinTechs. They ranged from the first transatlantic cable (1886) and ended with the 2008 financial crisis. Academic research about FinTechs is recent; they have grown from 2014 as the object of study. FinTech is considered a recent topic in the academic literature (Caciatori Jr; Cherobim, 2020). As digital banks represent a category of FinTechs, this work relies on three major theoretical concepts: innovation, competitive advantage, and financial innovation.

In Brazil, one of the uncertainties about the relationship between FinTechs and the incumbent banks derives from the banking concentration and the very structure of traditional Brazilian banks. Acting as “Multiple Banks”, they can operate banking portfolios of commercial, investments, home loans, leasing, and development under the same legal structure (Pineiro, 2016). They provide a broad of PS. The evaluation of the competition of these banks with new technology-based companies, which specialize in a specific PS, requires broad theoretical arguments to make exploratory considerations about this relationship.

We chose the first two theories to understand the dynamics of digitalized and digital banks as an example of new innovation-based companies in the financial industry. Innovation theories are useful for understanding the relationship between digitalized, digital, and incumbent banks because these theories can demonstrate how the creation, evolution, and decline of new technologies occurs.

Moreover, the concepts of market disequilibrium and the classification of these new enterprises as components of a new industry are examples of scenarios to be considered using the competitive advantage theories. To improve the knowledge about Fintechs, we also carried out a theoretical framework obtained from bibliometric research (Caciatori Junior; Cherobim, 2020).

We decided to adopt a mixed methods approach in an exploratory research design with qualitative and quantitative questions. As a result of these issues, we pose the mixed research question: How to build a framework to analyze the competitive impacts of new innovation-based companies over incumbent banks in the financial industry? In other words, what are the main factors that influence the substitution of banking PS already existing by those offered by digitalized and digital banks?

1.1 JUSTIFICATION OF RESEARCH

Research about FinTechs helps to clarify the role of these companies regarding competition and innovation in the financial industry. Besides, this study aims to contribute to the academic literature about FinTechs, an incipient field of research. As far as possible, we will contextualize the concepts and situation to the Brazilian context, characterized as a country with a high concentration in its banking industry.

The first practical argument is the role of FinTechs as new competitive agents and their possibilities to bring changes to the financial industry. According to Porter (2004), new companies can establish themselves in the industry, belong to a strategic group, or form a new industry. FinTechs present elements of the information technology industry not always present in the incumbent banks.

Bigtechs are another example of companies from other industries operating at the financial industry. These companies offer digital services (e.g., Amazon, Facebook, Google) and present a threat to incumbent banks (Frost et al., 2019). However, due to the differences in the challenges for banks from FinTech and BigTech firms (Stulz, 2019), BigTechs are not the scope of this work.

A distinctive feature of the relationship between FinTechs and incumbent banks is the difference between the adoption and creation of new technologies. While incumbent banks modernize existing and legacy systems, reducing the number of branches for face-to-face service, FinTechs do not need to adapt their old procedures because they are already new. Unlike incumbent banks, FinTechs do not need to adapt their processes to new technologies since their processes precede their technologies. This difference in the adoption of technologies can enable FinTechs to create their technologies according to their processes, free from adaptations of activities inherited from the more physical and analogic past.

Thus, the choice of a theoretical structure consisting of competitive advantage and innovation theories is one way to answer questions such as those previously exposed. We do not seek to build an ideal and immutable theoretical structure, but we aim to use elements of the selected theories to analyze this relationship between FinTechs and the incumbent banks.

International Monetary Fund (IMF) describes the competitive concerns about FinTechs and incumbent banks and its consequences: *“It is not yet clear also how competition (or lack of it) is shaping the development of the fintech sector, though large technology firms are expected to play an increasingly greater role in the provision of*

financial services" (IMF, 2019, p. 39). Section 3 (Theoretical study framework) provides some of the issues about this lack of clarity on the relationship between new companies and incumbents, represented by digital, digitalized, and incumbent banks.

The Brazilian financial industry has a high banking concentration level, where the five largest banks hold 69.8% of total assets, credit operations, and total deposits of the banking and non-banking sector in December/2019 (*Banco Central do Brasil* (BACEN) (2019a). In this concentrated market, banks can operate inefficiently and with higher interest rates paid by borrowers than other BRIC countries (Zhang et al., 2013). These high spread results in a lower percentage of loans than Gross Domestic Product (GDP) (ALMEIDA; DIVINO, 2015).

Another competitive concern is the Brazilian geographical dimension, where not all regions have enough bank branches offering credit for customers, for example. In line with this, the BACEN (2019a) assumes that technologies like FinTechs can contribute to expanding lending. This expansion can reduce costs and increase credit supply, enhancing competition in the sector without the need to open new bank branches.

It is essential to point out that new regulations as a consequence of the expansion of FinTechs. In Brazil, BACEN already published regulations and other documents about two FinTechs types: Peer-to-Peer (P2P) Lending and Open Banking, for example. In this work, we analyze Regulations only when related to incumbents, digitalized, and digital banks.

Our first argument is about competition. Hill; Rothaermel (2003) adds that new entrants can pioneer radical innovations and revolutionize competition in industries. However, it is not yet clear how the competition is shaping the development of the FinTech sector (International Monetary Fund, 2019), but BACEN (2018a) expect a growth of such companies in Brazil, as well as a growing interest by investors and customers. Buchak et al. (2018) and Financial Stability Board (2017) also raise questions about the future impacts of FinTechs on financial markets.

The second practical argument is about innovation and their resulting new technologies that we aim to analyze. One example of technologies in the financial industry is Credit Scoring and its results (Akhavain et al., 2005). The authors find out that this technology may affect the price of credit and increase credit availability for small businesses. As developers and users of new technologies, incumbent banks also

can use innovation in products, services, and organizational structures to circumvent regulation (Frame; White, 2004).

In Brazil, the banking industry is the one that relatively most invests in IT in order to increase profitability and competitive advantage (Fonseca et al., 2010). This phenomenon is mainly due to the historical monetary inflation, past restrictions on the use of foreign IT equipment, and the creativity of Brazilian banking technicians.

The financial industry is a sector well-known for originating and experimenting new technologies before the others on pioneering innovation. Besides, financial innovations have comprehensive coverage in our daily life Frame; White (2004). Barras (1990) highlights this industry as a vanguard sector for new technologies, which can provide the “initial momentum” of technological revolutions. Subsequently, this sector spread their innovations and experience to other sectors and contribute to total output growth. Our study also can help to contribute to poor knowledge regarding the sources of financial innovations (Lerner, 2006a).

As theoretical contribution, the present work intends to contribute to reducing the scarcity of studies about the impact of innovations in the service sector (Snyder et al., 2016), the relative dearth of empirical studies of financial innovation (Frame; White, 2004), and about FinTechs (Haddad; Hornuf, 2019). Brazilian and Russian banking sectors are described by Zhang et al. (2013) as mostly unresearched, especially compared to the Indian and Chinese ones. Still in academic literature, the theoretical gap in the bibliometric work by Caciatori Jr; Cherobim (2020) is essential due to the lack of papers exploring FinTechs in academic literature, also reported in the conclusions given by Milian et al. (2019).

1.2 GENERAL OBJECTIVE

Propose a framework to analyze the competitive impacts of new innovation-based companies over incumbent banks in the financial industry. In other words, we intend to define the main factors that influence the substitution of banking PS already existing by those offered by digitalized and digital banks.

1.3 SPECIFIC OBJECTIVES

We present the specific objectives as a sequence of activities to match our goal.

1. Conceptualize and define incumbent, digitalized, and digital banks;
2. Create a model of FinTechs categorization based on already existing classifications in the literature;
3. Categorize Brazilian banking PS offered in the Brazilian financial industry;
4. Detach the financial products and services offered by incumbent, digitalized, and digital banks;
5. Create an inventory of technologies used in the financial industry and identify who introduced them;

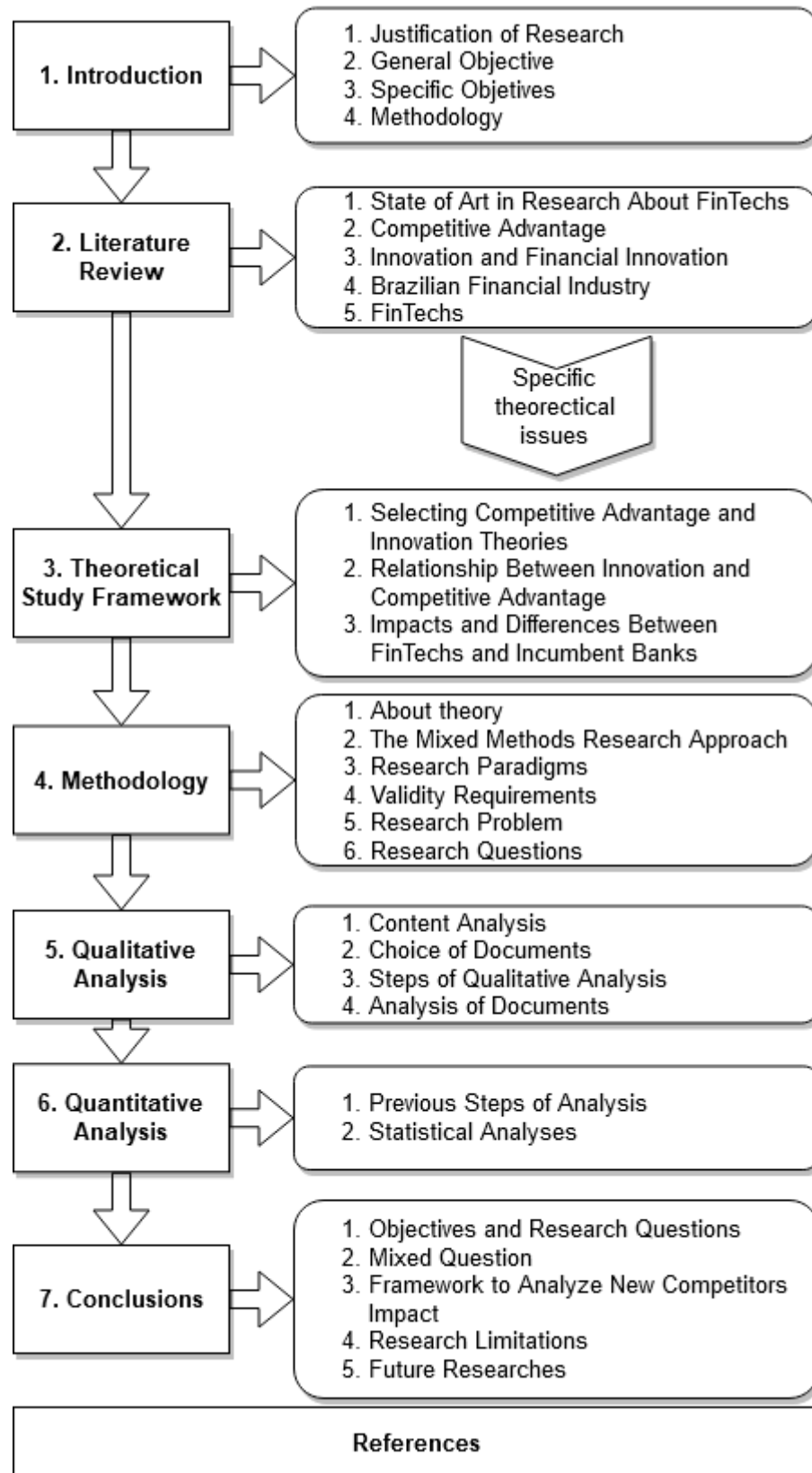
We will also develop a comparative example between an incumbent bank and a digitalized bank that belongs to the same economic group.

1.4 METHODOLOGY

The present work aims to apply a Mixed Methods Research Design. The mixed approach is useful in this research because it allows an exploratory view using qualitative and quantitative data.

To accomplish the research objectives, the present work contains seven chapters: introduction; literature review; theoretical study framework; methodology; qualitative analysis; quantitative analysis; conclusion; and references, as we describe in Figure 1.

FIGURE 1 – STRUCTURE OF THE WORK



SOURCE: ELABORATED BY THE AUTHOR (2020)

Also, as financial innovations involve new technologies, academic literature is still incipient (Caciatori Jr; Cherobim, 2020), though it justifies the use of gray literature, composed of some papers or works from non-academic sources. Thus, without wide dissemination in publications with the peer review process, the subject competes with the 'grey' and non-academic literature. Financial technology companies fall into this spectrum.

Schueffel (2016) also justifies the use of gray literature. The author emphasizes that the strictly quantitative treatment via bibliometric metrics and the exclusive use of peer-reviewed articles could disregard recent and relevant articles in the area.

The grey literature is classified as those materials publicly disclosed and not subject to the traditional peer review process, and it is a way to expand the scope of searches, insert updated materials on the concept studied, and enable new discussions on the research theme (Adams et al., 2017). Also considered a timely and comprehensive source of information (Lawrence et al., 2014), this literature includes business reports, works for discussion, guides to procedures, and business reports.

Therefore, it is natural that the initial research of a non-academic nature should appear before academic studies. The articles published in scientific journals go through peer review and result from complex research, supported by theories and methodological basis. Thus, the time required to meet these procedures may cause a longer response time of academic studies analyzing the phenomena compared to that provided by the analyses that do not pass through this screen, such as the disclosures via grey literature.

2 LITERATURE REVIEW

In the present section, we introduce state-of-the-art research about FinTechs, concepts of competitive advantage, innovation and financial innovation, Brazilian Financial Industry, FinTechs, and the categorization issue concerning such companies. The discussion and research about these subjects serve as theoretical and conceptual background for this work. In this chapter, we aim to clarify how we carry out the choice of theories used in this work.

To select the competitive advantage theories, we use the work of Vasconcelos; Cyrino (2000), where the authors revised these theories and split them into four groups: Industrial Organization; Resources; Market Processes; and Dynamic Capabilities. This division allows the analysis of the four theoretical theories separately, without jeopardizing the concepts, authors, and associated theories.

For the studies of innovation, we choose the work of Fagerberg et al. (2012), which splits this field into three theoric groups (from now on clusters): Organising Innovation; Economics of Research and Development (R&D); and Innovation systems. These three clusters result from the analysis of 11 Handbooks about innovation (277 chapters), which contains 21,313 references (from 14,857 different documents).

The choice of clusters of innovation and competitive advantage was built based on the authors and works displayed in Figure 2.

FIGURE 2 – INNOVATION AND COMPETITIVE ADVANTAGE CLUSTERS

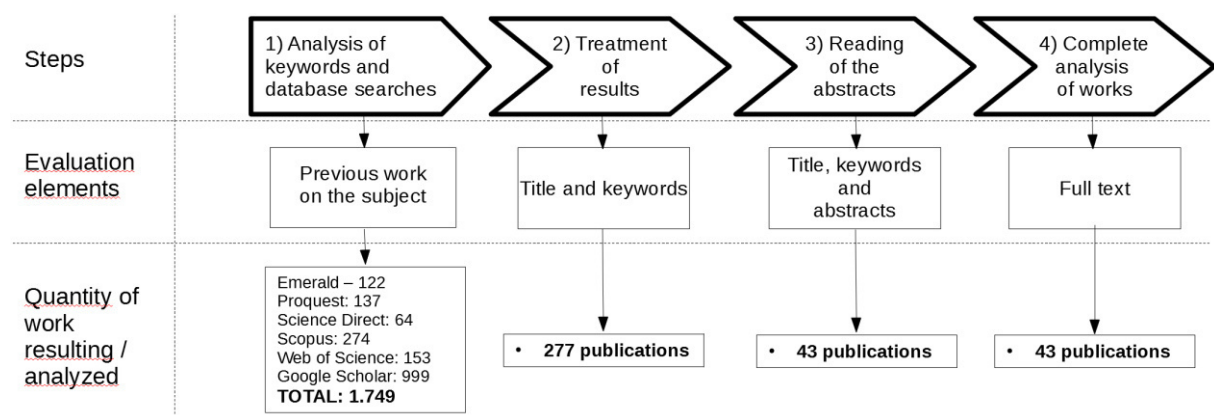
Theories	Reference Paper	Cluster	Thematic focus	Most relevant works/authors
<i>Competitive Advantage</i>	Vasconcelos; Cyrino (2010)	Industrial Organization	Industry	Porter, M.; Ghemawat, G.; Shapiro, C.
		Resources	Resource stocks; Specific competences	Rumelt, R.; Wernerfelt, B.; Barney, J. B.; Peteraf, M.
		Market Processes	Market dynamics, cycles of creation and destruction, innovation, imitation, selection	Jacobson, R.; D'Aveni, R.
		Dynamics Capabilities	Organizational processes and routines, resource streams, specific competences	Teece, D.; Pisano, G.; Shuen, A. Prahlada, C. K.; Hamel, G. Dierickx, I.; Cool, K. Amit, R.; Schoemaker, P. Sanchez, R.; Heene, A.; Thomas, H.
<i>Innovation</i>	Fagerberg (2012)	Organising Innovation	Innovation, Organization, Sector/Industry, Firm	Nelson; Winter (1982); Rogers (1983); Cohen & Levinthal (1990)
		Economics of R&D	Economics, R&D, Innovation, Technology	Porter (1990); Schumpeter (1983); Freeman (1974)
		Innovations Systems	Innovation, System, Technology, Macro	Nelson (1993); Lundvall (1992); Freeman (1987)

Source: The author (2020) based on Fagerberg et al. (2012) and Vasconcelos; Cyrino (2000)

2.1 STATE OF THE ART IN RESEARCH ABOUT FINTECHS

We carried out extensive bibliometric work (Caciatori Junior; Cherobim, 2020) starting from 1,749 publications in six datasets (Emerald, ProQuest, Science Direct, Scopus, Web of Science, and Google Scholar). In this research, we found just two review studies on FinTechs (Cai, 2018; Martinez-Climent et al., 2018) and a bibliometric study (Wu, 2017b) stand out, which did not suggest theories of administration to understand these types of companies. Figure 3 demonstrates the steps of the bibliometric research by Caciatori; Cherobim (2019).

FIGURE 3 - FLOWCHART WITH THE BIBLIOMETRIC RESEARCH STEPS



SOURCE: CACIATORI JR; CHEROBIM (2020)

One of the approaches that we analyzed divided the 43 articles selected in the fourth step according to the title and subject of the publications. From 39 different publications/books found, the maximum concentration identified was three articles per publication. The scientific journals with the most published articles are the Journal of Economics and Business, with three articles, and Electronic Markets and Financial Innovation, with two each. Figure 4 lists the seven articles concentrated in the three academic journals:

FIGURE 4 - CONCENTRATION OF ARTICLES PUBLISHED BY EACH PUBLICATION

Authors	Title	Year	Source
Jagtiani, J.; Lemieux, C.	- Do fintech lenders penetrate areas that are underserved by traditional banks?	2018	Journal of Economics and Business
Anagnostopoulos, I.	- FinTech and regtech: Impact on regulators and banks	2018	
Drasch, B. J.; Schweizer, A.; Urbach, N.	- Integrating the Troublemakers: A taxonomy for cooperation between banks and fintechs	2018	
Alt, R.; Beck, R.; Smits, M. T.	- FinTech and the transformation of the financial industry	2018	Electronic Markets
Gimpel, H.; Rau, D.; Röglinger, M.	- Understanding FinTech start-ups - a taxonomy of consumer-oriented service offerings	2017	
Zavolokina, L.; Dolata, M.; Schwabe, G.	- The FinTech phenomenon: antecedents of financial innovation perceived by the popular press	2016	Financial Innovation
Li, Y.; Spigt, R.; Swinkels, L.	- The impact of FinTech start-ups on incumbent retail bank's share prices	2017	

SOURCE: Caciatori; Cherobim (2019)

Considering the illustrated evolution in research, we highlight that two of the three journals with the most significant number of publications (Electronic Markets and Financial Innovation) analyze the digital economy and publish innovative studies on finance research. This indicator shows an initial interest in the aspects of FinTechs, which can be followed by a more in-depth analysis of the impacts of these new companies using Business Administration theories.

The first, Journal of Economics and Business (three articles), focuses on finance and economics studies. Its interest is in related topics (e.g., industrial and financial structure of companies, insurance, monetary policy, and financial markets).

As for Electronic Markets, it covers several aspects of the digital economy and is interested in business networks enabled by IT (digitalization). Finally, Financial Innovation also seeks innovative studies on research in finance. Its main topics covered are derivatives, asset pricing/hedging, and disruptive models.

The remaining 27 publications revealed a division into three main research interest lines: Business (13); IT (10); and Legislation (two). It is useful to clarify the allocation of the two articles in the Legislation area, which demonstrates the concern of the work with the regulation and preparation of standards to enable the stable development of the sector. By region, the sites with the highest number of publications were the United States (17), United Kingdom (8), Germany (5), and Holland (4).

The distribution of articles in different publications is by the fact that it is an emerging concept and still little explored academically (Wu, 2017; Puschmann, 2017; Schueffel, 2016) or the lack of a broader definition of the subject (Anagnostopoulos,

2018; Dorfleitner et al., 2017; Eickhoff et al., 2018; Gimpel et al., 2017; Larsson et al., 2018; Zavolokina et al. 2016).

We identify different treatments given to FinTechs in the literature (Caciatori Jr; Cherobim, 2020). Among these different ways/views of analysis of these companies, four stand out, which we describe in Table 1.

TABLE 1 - TREATMENT OF THE FINTECHS THEME BY THE ANALYZED ARTICLES

Article Focus	Year				Total
	2015	2016	2017	2018	
<i>Categorization of FinTechs</i>	1	3	5	5	14
<i>Theory of Disruptive Innovation</i>	-	3	4	5	12
<i>Relationship with the Theories of Administration / Economics</i>	1	2	5	2	10
<i>Regulation / Legislation</i>	1	2	1	2	6
Total	3	10	15	14	42

SOURCE: Caciatori Jr; Cherobim (2020)

The categorization of FinTechs, the subject of 14 out of 43 articles analyzed, seeks to situate the phenomenon, compare the activities of these companies with those of existing banks and classify the main differences among them, which can serve as a basis for new research. The growth in the number of articles published with this purpose, from one in 2015 to five in 2018 (Table 1), demonstrates a growing effort of the authors to provide subsidies for the study of the theme.

Regarding the use of theories to explain the phenomenon, we found some applications and concepts that can guide the research about FinTechs. The theory of disruptive innovations, cited in 12 of the 43 articles analyzed (Table 1), is the most used in treating the phenomenon. This theory compares the emergence of other industries that did not exist before or were not theoretically conceived (Christensen, 2013).

Other theoretical approaches in business administration and related sciences, such as institutional theory, were used in 10 of the 43 articles analyzed. It characterizes the search for more theoretical definitions of the phenomenon as a critical gap and an opportunity for researchers.

From the first publications, looking to conceptualize the subject, to the most recent ones, there is the emergence of new research areas, such as small and medium enterprises, regulatory aspects, acceptance of technologies, and the deepening in specific sectors (e.g., payments and value transfers) of this new industry. This change in perspectives is due to the evolution of research on the subject. Even at an early

stage, it goes beyond conceptual aspects to experiment with more elaborate investigation forms.

The next four topics demonstrate and include comments about papers that sought to categorize FinTechs, relating them to disruptive innovation, use theories of administration to understand the subject, and analyze the subject according to regulatory aspects and legislation.

2.1.1 Categorization of FinTechs

The 14 articles classified as “Categorization of FinTechs” sought to divide into specific categories the activities performed, tools used, and the environment of these companies. For this purpose, they compared the PS offered by them with those made available by incumbent banks.

In these categorizations, the four most cited types of PS are loans/financing, investments, value transfers, and insurance. Examples of articles that used this division are de Wu (2017), D. Arner et al., 2015; Mittal & Lloyd (2016).

Distinct divisions and classifications from those described above involve, for example, tools and the environment of these companies, such as those presented in the articles by Eickhoff et al. (2018) and Gomber et al. (2017). International Organization of Securities Commissions (IOSCO - 2017) separates FinTechs into payments, insurance, planning, loans, blockchain, investments, data analysis, and security.

2.1.2 Theory of Disruptive Innovation

One of the leading associations existing in the literature for categorizing the innovative stage of FinTechs is disruptive innovations (Chiu, 2016; Gomber et al., 2018; Larsson et al., 2018; Schuelke-Leech, 2018).

The mention that relates FinTechs to the theory of disruptive innovation (and its variations) appeared in 12 of the 43 selected works. Examples of articles with this analysis are Chiu (2016), Dorfleitner et al. (2017), Gomber et al. (2018), Larsson et al. (2018) e Zalan; Toufaily (2017).

In addition to the innovation concepts and typologies exposed, disruptive technologies come from the field of innovation (Organization for Economic Co-operation and Development (OECD), 2005), and their initial ideas come from the work by Christensen (2013). The author indicates that traditional technologies offer more

than customers want. Besides, leading companies and more profitable customers in traditional markets ignore emerging or insignificant markets or do not want (or can not) use these new technologies. This positioning of leading companies opens up space in the market to the disruptive technologies, which initially offer fewer PS than customers want (or think they want).

Other examples in the literature have applications in the fields of pharmaceutical products (Sabatier et al., 2012), telecommunications (Boccardi et al., 2014), education (Conole et al., 2008; Sharples, 2002), and photographic equipment (Lucas Jr e Goh, 2009). Adner (2002), Danneels (2004), Govindarajan e Kopalle (2006), Markides (2006), Paap e Katz (2004), Schmidt e Druehl (2008), and Yu e Hang (2010) also develop further improvements and discussions of the concept.

Puschmann (2017) approaches this relationship with the development of a conceptual framework with three dimensions. In this model, the author differentiates FinTechs according to the type of innovation (disruptive or incremental), the scope of innovation (intra or inter-organizational), and the object of innovation (business models, PS, organization, process, or system). An issue about the use of the theory of disruptive innovation in these types of companies, cited by Anagnostopoulos (2018), says that additional data are needed to understand the phenomenon in a more profound way.

2.1.3 Relationship with Management / Economics Theories

Out of the ten articles that exposed the relationship between FinTechs and theoretical approaches to administration and related sciences, four of them stand out: FinTechs and the theories of the diffusion of innovations (Wonglimpiyarat, 2018), FinTechs and institutionalism (Larsson et al., 2018), FinTechs and two-sided markets (Jun; Yeo, 2016), and FinTechs and banking microeconomics (FSB, 2017).

Among the 43 articles selected, only ten (23%) explain their theoretical approaches. Lack of theoretical approaches can be explained by the incipency of the theme, still in the development of ideas and categorization phase, without a consensus of the most suitable theories and methodologies to study the phenomenon.

2.1.4 Regulation and Legislation

D. Arner et al. (2015), Chiu (2016), Dombret (2016), Anagnostopoulos (2018), Lagarde (2018), and FSB (2017) deal with the regulation of FinTechs and concern

about the dynamics inherent in these companies. This concern is evident because regulatory agencies or government financial institutions elaborated three of these studies.

The emerging concept and the insertion of the topic in the financial market environment raise concerns about the legislation. We verify these concerns by the existence of articles that address the regulatory aspects of FinTechs also in publications in the area of “law and regulation” since they operate in a segment subject to systemic crises and show fewer barriers for entry than conventional banks. As described by FSB (2017), these companies show several types of risks to the financial system, mainly related to IT, which demands agility from regulators.

Therefore, as a result of this bibliometric research, we do not identify a consensus about the Business Administration theories most used to understand these types of companies or the most appropriate concepts to explain FinTechs (CACIATORI JR; CHEROBIM, 2020). This gap allows considering the subject as open to possibilities of researches and understanding by the established theories. Thus, it is important to reinforce that one of the justifications of the present work is the need to deepen the study of FinTechs. It is because the subject lacks theories to explain the phenomenon and its competitive consequences.

2.2 COMPETITIVE ADVANTAGE

To support the analysis, we use the concept of competitive advantage of Vasconcelos; Cyrino (2000, p. 20) in which *"competitive advantage means the occurrence of economic performance levels above the market average according to the strategies adopted by the firms."*

In addition to its relationship with economic performance, competitive advantage generates benefits for costumers. This view is used to analyze the strategy of firms to create value for buyers (PORTER, 1998). For Barney (1991), this advantage should generate exclusive benefits for firms. Thus, the value creation strategies adopted by a company can not be implemented simultaneously by another competitor. Additional concepts of competitive advantage also are described by Peteraf (1993), Ghemawat (1986), Cantwell (2004), D'Aveni (1994), and Schoemaker; Amit (1993).

The following sections present the four divisions of studies on competitive advantage, according to the work of Vasconcelos; Cyrino (2000).

2.2.1 Industrial Organization

The industrial organization theory has its origins in Mason (1939) and J.S. Bain (Andreano; Warner, 1958) with the structure-conduct-performance model. This model defines external factors - the structure of the industry - as primary determinants of the performance of firms. The authors consider price and market structures as determinants of competitiveness and identify "rewards" reflected in the most profitable prices, which increase the mobility of factors between industries and reduce prices and "rewards" between them. This loss of profitability demands the use of market barriers as instruments to maintain these advantages.

Competitiveness is associated with components external to the industry, classified as competitors: new entrants, competitors, substitutes, buyers, and suppliers (PORTER, 2004). These factors constitute the extended rivalry. In turn, the generic competitive strategies of leadership in total cost, differentiation, and focus are ways for firms to outperform their competitors in an industry.

The author also emphasized the importance of positioning in the concept of strategy, which means performing different activities than rivals or performing similar activities in different ways (PORTER, 1996). Despite the criticisms of Nelson; Winter (1982) of this concept being static and not considering the evolution of firms, Porter (1985) and Porter (1998) contest this criticism. The author uses the concepts of life cycle, technological evolution in the analysis of industries, and internal aspects of the firms (value chain and resources) to demonstrate how the dynamic components of the positioning theory work.

Other concepts of the Industrial Organization school are the sustainable competitive advantage, commitment via sticky factors Ghemawat (1986), and the game theory analysis in the analysis of strategic behavior (SHAPIRO, 1989).

We conceptualized the theory of industrial organization as: in a static analysis, the structure and barriers of the industry, the position of the company in its strategic group, the extended rivalry, and the investment in assets of difficult detachment determine the performance and competitive advantage of firms.

2.2.2 Resources

Resource theory characterizes firms as repositories of resources, heterogeneous in terms of these elements and their internal capabilities, and aided by an administrative framework (ANDREWS, 1977; PENROSE, 2006). Another pioneer

of this theory is Selznick (1972), who highlighted the role of the character of the organization as a historical product and adopted Institutionalism (DiMaggio; Powell, 1983) as reinforcement against external pressures.

Based on these theories, Barney (1991) mentions the resources, internal aspects of the firms, as those responsible for sustained competitive advantage. In opposition to the Industrial Organization theory, the author states that the strategic resources must be heterogeneous among firms, not present perfect mobility between them, and have four characteristics: value, rarity, imitability, and substitutability.

This opposition to the theory of Industrial Organization also stipulates that, in the view of resources, the generation of value for firms does not occur exclusively by monopoly power, but by the Ricardian rents derived from inelastic supply and the scarcity of resources (BARNEY; CLARK, 2007; PETERAF, 1993). Thus, the maintenance of competitive advantage uses isolating mechanisms to preserve the income flows of firms and prevent imitation (RUMELT; LAMB, 1997). Besides, barriers to entry and resource position barriers (Wernerfelt, 1984) maintain the monopoly situation of firms, protect the competitive position, and enable the exploitation of the benefits generated by it.

Thus, we conceptualize the resource-based view as follows: the heterogeneity, scarcity, and immobility of resources are responsible for the sustained competitive advantage of firms, protected by the isolating mechanisms and the resource position barriers.

2.2.3 Market Processes

With a process-oriented vision and market dynamics, the theory of Market Processes originates from the Austrian School of Economics and emphasizes market imbalances as significant entrepreneurial discovery events. It also has components imperfect information, flexibility, continuous innovation, temporal heterogeneity, and unobservable influence of business performance, which hinders copies and imitation (JACOBSON, 1992).

In his first phase (Mark I), Schumpeter (1983) highlights the cumulative development process and the creative destruction process as a generator of entrepreneurial rents. The process of destruction encompasses five stages: entrepreneurial innovation; high profits encouraged by innovation; imitation of

innovations with the disappearance of profits; return of the market to balance; and the emergence of another innovation to replace that previously imitated.

The creative destruction also acts as a reinforcement to one of the general ideas of the theory of Market Processes, in which the advantages are temporary, and there is no sustained competitive advantage (JACOBSON, 1992). On the durability of competitive advantage, D'Aveni (1994) highlights four strategies used by firms in competition: cost-quality advantages; timing and know-how; breaking down strong barriers to entry; and "deep pockets" (firms with vast financial resources). For the author, sustainable strategies are challenging to find.

Market Process theorists criticize the Industrial Organization theory for ignoring uncertainty and disequilibrium in the business environment (JACOBSON, 1992). Likewise, they emphasize that the exclusivity in using variables visible by econometrics for modeling phenomena prejudices the analysis (ITAMI; ROEHL, 1991). For these authors, invisible assets largely determine the performance of firms, and econometric methods are inefficient in measuring them.

The summarized concept of Market Process theory states that market imbalances, creative destruction, and factors invisible to firms create competitive advantage. However, this advantage can not be sustained due to the dynamics of market processes.

2.2.4 Dynamic Capabilities

Considered an evolution of resource theory, Dynamic Capabilities (also classified as a theoretical perspective) resemble "layers" of capabilities with mutations and evolutions. In conjunction with isolation mechanisms, these elements enable the sustainability of competitive advantage in a less static view than the Resource Theory (TALLMAN, 2003). These capabilities have foundations on the theories of Ricardian and Pareto economic rents, causal ambiguity and isolating mechanisms (Rumelt; Lamb, 1997), quasi-rents (Peteraf, 1993), routines (Nelson; Winter, 1982), Firm Theory (Penrose, 2006), and Resources (BARNEY; 1991).

The Dynamic Capabilities framework of Teece et al. (1997) analyzes the sources and methods of value creation and capture by companies, adding concepts from the predecessor schools about strategy and competitive advantage. It also considers the Schumpeterian concept of competition based on innovation, rivalry in price, performance, increasing returns, and creative destruction of existing

competencies (Mark I). This framework also includes concepts of path dependence, organizational learning, asset accumulation, processes, and positioning.

Nelson (1991) defines one of the relationships between innovation and Dynamic Capabilities and highlights the organizational differences (mainly the skills) as sources of sustained competitive advantage through innovation. Thus, in comparison with the competencies of firms, technologies are less likely to generate competitive advantage because they are more simplified understanding phenomena.

Other authors identified by Vasconcelos; Cyrino (2000) as components of the Dynamic Capabilities theory are PRAHALAD; HAMEL (1990). The contribution of these authors is in the concept of core competencies, characterized as *"collective learning in the organization, especially how to coordinate diverse production skills and integrate multiple streams of technologies"* (Prahalad; Hamel, 1990, p. 4). Besides, they add that a critical task for management is to create products that consumers had not yet imagined. This idea approaches the concept of disruptive innovations (CHRISTENSEN, 2013).

Another component of Dynamic Capabilities cited by Vasconcelos; Cyrino (2000) is the Behavioral Decision Theory, presented by Schoemaker; Amit (1993). These authors treat this theory as a third alternative in the competitive advantage study, in addition to the theory of Industrial and Resource Organization. Based on the principle of bounded rationality (Simon, 1976), the Behavioral Decision Theory states that managers repeat future actions that were successful in the past.

The summary of the concept of Dynamic Capabilities denotes a compilation of ideas by authors of theories of Industrial Organization, Resources, and Market Processes: the competitive advantage sustained in this theory is the result of the capability layers of firms, with their mutations and evolutions, associated with the concepts of Ricardian and Pareto rents, causal ambiguity, quasi-income, resources, routines, core competencies, and creative destruction.

2.3 INNOVATION AND FINANCIAL INNOVATION

For the study of innovation, this work uses the classification of Fagerberg et al. (2012), as shown in section 2., which divides the study of innovation into three groups: Organising Innovations; Economics of R&D; and Innovation Systems. We also conceptualize the financial innovations and their role in the financial industry.

2.3.1 Innovation: Conceptualization and Components

Fagerberg et al. (2012) define that the fundamental concept of innovation is the one provided by Schumpeter (1983), where innovation is the commercial or industrial application of something new. This novelty can be a product, process or production method; a new market or source of supply; and a new form of commercial, business or financial organization. Schumpeter (1983) centralizes the innovation in the entrepreneur, the bearer of the mechanism of change.

Described as a multidisciplinary field of knowledge (Goldsmith; Foxall, 2003; Rosenberg, 1976), innovation must be studied in many ways and used as an explanatory factor to the differences in the performance among firms, regions, and countries. Despite the broad research opportunities (Shavinina, 2006), innovation lacks studies about their origins due to the predominance of research about innovation dynamics (FAGERBERG, 2004).

The historical perspective on the innovation studies is related to the systematic evolution of this subject study between the XIX and the XX centuries and the most important innovations in this period (MOWERY; ROSENBERG, 2005). Fagerberg et al. (2012) break down the study of innovation into four stages: until 1970, with low interaction among disciplines and concentrated on studies in the areas of Economics and Sociology; growth stage, between the 1970s and the end of the 1980s (creation of the Science Policy Research Unit - SPRU); maturation, at the end of the decade and 1980; and the emergence of the literature on Innovation Systems, which occurred after the end of the 1980s.

The treatment of innovations as synonymous of new combinations was also created by Schumpeter (1983) and complemented by Lundvall (2010). For these authors, future innovations depend on pre-existing components and possibilities, which reflect new ways of combining existing knowledge in firms. The OECD (2005) also highlight this dependence on pre-existing elements and states that innovation is new and significantly improved compared to its previous versions.

In addition to the multidisciplinary nature of innovation, Cumbers et al. (2008) emphasize its lack of linearity, uniform dimensionality, and the absence of a universal metric of its impact. For the authors, these are consequences of the complexity, lack of order, and uncertainty involved in the concept, considered a black box (KLINE; ROSENBERG, 1986). Besides, Lundvall (2010) points out that innovation experiences

changes during its diffusion, which is harmful to its characterization and also when trying to differentiate it from invention.

Innovation also depends on previous experiences and formal knowledge (Dosi, 1988) and involves technological changes at the level of firms in production, marketing, investment, and management processes (CHRISTENSEN, 2013). Moreover, innovation covers product design and manufacturing processes that are new to companies, the universe, and the nation (NELSON; ROSENBERG (1993).

As the primary constituent elements, the innovation must be recent, original, and have similarity, representing how similar or different this artifact is from something existing (GOLDSMITH; FOXALL, 2003). For Poole; Van de Ven (2004), innovation is a partner for change and the source of economic and social progress, being a product and a facilitator of the free exchange of ideas at the same time.

Schumpeter (1983) states that the entrepreneur directs the changes in consumer habits, which are stimulated to perceive previously non-existent needs about the role and perception of consumers. The role of the entrepreneur in consumer habits, with the application of the Resource Dependency Theory (Pfeffer; Salancik; 2003), is one of the foundations of the Disruptive Innovation Theory (CHRISTENSEN; 2013).

Still on the perception of consumers, (Rogers, 1983) emphasizes that consumers do not care about the time lapse since the first use or discovery of innovation. Thus, innovation is the idea that seems new to the individual, which reacts based on the perceived novelty.

Henderson; Clark (1990) complement the discussion about innovation using radical and incremental innovation (SCHUMPETER, 1997). The first case occurs the break of continuity and departure from past practices, while the incremental innovation is the small additions to existing processes/products. For these authors, some technical innovations classified as complementary have substantial competitive consequences. Also, Porter (1990) states that incremental innovations are more common in everyday life than radical ones.

A contribution to these two types of innovation concepts is the architectural innovation, provided by Henderson; Clark (1990). This category *"changes the way in which the components of a product are linked together, while leaving the core design concepts of design (and thus the basic knowledge underlying the components) untouched"*. (Henderson; Clark, 1990, p. 10).

Schumpeter (1983) defines the difference between invention and innovation. Innovations involve the commercial application of any new idea. Thus, based on existing knowledge (Kostoff, 2003), innovations must have economic utility and be integrated into the operations and strategy of firms to generate impacts on how the organization creates value (CARAYANNIS ET AL., 2003).

Cantwell (2004) relates innovation to profits and conceptualizes it as the residual of the profitability of production factors. Thus, the innovation process results are "the surplus" of profitability after the calculation of the results of profits earned with the application of production factors (e.g., capital and labor).

Other applications of the concept are related to the competencies of the company, as innovation being a *"precursor activity, originally rooted in the internal competencies of the company, to develop and introduce a new product in the market for the first time"*. (KIM; NELSON, 2005). Related to knowledge, Feldman; Kogler (2010) adds that *"innovation is the ability to mix and weave different types of knowledge into something new, different and unprecedented, with economic value. Similar to art, it is a creative expression"* (Feldman; Kogler, 2010, p. 384–385).

Dosi; Nelson (2010) emphasizes the importance of past experiences represents the cumulative nature of the innovation. The authors emphasize the dependence of the future on the stock of past achievements in the innovation area because "success generates success". Experience also pointed is out by Feldman; Kogler (2008), because innovation depends on insights, decisions, responses to events, and technological choices of the past. Other authors who address the accumulation of experience are Carayannis et al. (2003); Leibovitz (2008); Pavitt (1984).

This cumulative nature of the innovative process contributes to the concept of absorptive capacity (COHEN; LEVINTHAL, 1990). This capacity represents the union of prior knowledge and shared language, which provides skills for the recognition, assimilation, and application of new information by firms to the commercial media.

Arrow (1962) highlights the role and consequences of innovation in competition, monopoly power, and incentives to innovate from an economic perspective. Schumpeter (1983) also relates the innovation concept with the monopoly and their profits.

Still, under this perspective, Rosenberg (1976) relates the study of innovation with technology. Nelson; Winter (1982) relate innovation with the theory of natural

selection and the organizational routines as a tool to analyze the economic changes in demand/supply generated by innovation.

2.3.2 Innovation Clusters

The present work analyzes innovation from a specific perspective in the literature (organising innovation), so it is essential to point out the steps to this choice. The work by Fagerberg et al. (2012) splits innovation studies into three clusters, as detailed in section 2.

The first cluster, organising innovation, focuses on innovation, organizations, sectors/industry, and firms. Composed of 50 of the 130 works, it focuses on the field of Management and Business. The most cited work in this grouping is that of Nelson; Winter (1982) and the Strategic Management Journal is the publication more significant that cites the works of this group.

The R&D Economy cluster is the largest of the three, with 66 papers among the 130 selected. It has as fields of interest economic aspects of R&D, technology, and innovation. In addition to Economics, the Social Sciences and Humanities are also fields of research that cite works of this group. The most cited work is that of Porter (1990), followed by Schumpeter (1983) and Freeman; Soete (2008). Although publications in Economics are among the most cited works of this group, Fagerberg et al. (2012) highlight others of Business, Management, and Environmental Studies, which characterizes it as a broad grouping of research.

Finally, the cluster of Innovation Systems is the smallest of the three, with 14 papers among the 130 most cited. The most cited works deal with national innovation systems (e.g., Lundvall, 2010; Nelson; Rosenberg, 1993). The other publications cited are in the fields of Management, Economics, and Regional Studies/Urban. This cluster has as its intellectual background some members of the SPRU.

We describe the summary of the innovation concepts of the most cited works in these three clusters in Figure 5.

FIGURE 5 – CONCEPTS AND ELEMENTS OF INNOVATION

Cluster	Author(s)	Brief concept	Elements
1 – Organising innovation	Christensen (2013)	Changes and dependence of technology	Technologies of production, marketing, investments, and management processes
1 – Organising innovation	Rogers (1983)	Idea, practice, or object perceived as new	Perception of newness; the individual determines the novelty
1 – Organising innovation	Henderson; Clark (1990)	Change in how the components of a product are interlinked	Architectural innovation; Innovation generates strong competitive consequences
2 – Economics of R&D	Schumpeter (1983)	Commercial or industrial application of something new	New product, process or production method; Incremental or radical; Change of habits
2 – Economics of R&D	OECD (2005)	Implementation of something new or improved	Product, process, marketing method or organizational method
3 – Innovation Systems	Dosi (1988)	Experience-based problem solving	Tacit knowledge; Formal knowledge; Specific capabilities
3 – Innovation Systems	Nelson; Rosenberg (1993)	Projects of new products for the companies, nations and world	Economic rents; National technological capabilities
3 – Innovation Systems	Lundvall (2010)	New combinations of components and firm knowledge	Experience; New combinations
3 – Innovation Systems	Kim; Nelson (2005)	A forerunner activity that develops and introduces a new product into the market	Internal competences
Undefined	Kogler (2010)	Mixing different types of knowledge into something new and with economic value	Creativity; Economic value; Criatividade; Social return
Undefined	Carayannis et al. (2003)	Social process dependent on the intervention and management of people	Integration on operations and strategies; Value creation
Undefined	Kostoff (2003)	Metamorphosis of the actual from a better practice	Existing knowledge; Information discovery; Invention
Undefined	Poole; Van de Ven (2004)	The source of economic and social progress	Innovation as a product; Enabler of the exchange of ideas
Undefined	Cantwell (2004)	Residual profitability of factors of production	Neoschumpeterian approach; Residual perspective

SOURCE: The Author (2020)

To summarize the concepts, in the first cluster, Organising Innovation, innovation is defined as a phenomenon dynamic, evolutionary, and dependent on technology/organizational routines. This phenomenon should generate products perceived by consumers as new or improved.

In the cluster of Economics of R&D, innovation is the creation/implementation of PS or radical/incremental improvements in existing PS. These changes need to be promoted by entrepreneurs based on accumulated experience, operating in a regime of imperfect competition, competitive impacts, and economic growth.

Finally, in the cluster of Innovation Systems researchers, innovation is a complex and new process for the firm, nation, and universe. This process is based on experience and accumulated knowledge and has consequences for the industry structure in which the firm operates, for economic performance and national technological capabilities.

2.3.2.1 Financial Innovation.

The concept of financial innovation can be considered a strand of the Schumpeter (1983) definition by Frame; White (2004). The authors classify financial innovations in new products (e.g., adjustable-rate mortgages, exchange-traded index funds); new services (e.g., online securities trading, internet banking); new "production" processes (e.g., electronic record-keeping for securities, credit scoring); or new organizational forms (e.g., a new type of electronic exchange for trading securities, internet-only banks).

Still, Miller (1986) states that the taxes and the regulations are some triggers of these innovations regarding sources of financial innovations. These innovations arise because when the governments change the regulation or the tax structures, companies innovate, trying to reduce their costs or create new PS to avoid the new regulation or changes in the tax structure.

Frame; White (2004) complement that the financial innovations are motivated by general structural conditions (e.g., market power and technological opportunity), conditions that influence "equilibrium" rates (e.g., macroeconomic conditions and regulation), and changes in environmental conditions. Finally, Van Der Boor et al. (2014) highlights the role of user needs as inducements of innovation in complement to changes in the tax system or technological opportunity.

Financial innovations can arise in three different ways: creating new PS, modifying the already existents; or improving the back-office processes. Although the incumbent banks can develop innovations, Van Der Boor et al. (2014); Oliveira; Von Hippel (2011) relate that most financial innovations were self-provided by users before being offered by banks in order to satisfy the unmet needs of users. Furthermore, Van Der Boor et al. (2014) argue that these users innovations present higher adoption rates than producer innovations.

Thus, users can produce their financial PS based on their own needs. Oliveira; Von Hippel (2011) argue that there is a range of user-developed self-services that are not offered commercially by banks, mostly "adjacent" activities. The authors cite it is difficult for banks to identify and develop services related to these activities and emphasize that suppliers of "adjacent" activities have advantages over other service providers.

Some categories of financial innovations include account information services, account transaction services, and new channels to access banking services (OLIVEIRA; VON HIPPEL, 2011). The offer of financial PS also can be "broadly" and "narrow", depending on if producers offer the multiplicity of PS in a whole or fragmented way. In another classification, Snyder et al. (2016) propose a platform to analyze service innovation according to different categories: the degree of change (radical vs. incremental); type of change (products vs. processes); newness (new to the firm vs. new to the customer; and means of provision (technology vs. organization).

In connection with the broad and narrow offer of services, Barbosa et al. (2015) suggest that market power increases with more products offer. The authors show that, in the particular case of economies of scope, the multi-product banks offering classic services (e.g., brokerage and currency exchange) and other banking products (e.g., insurance, life insurance, and capitalization bonds) are more efficient than two separate entities selling these PS separately. Banks offering classic and other banking products have substantially higher market power than banks that offer classic products only.

Among the benefits of financial innovation, Pinheiro (2016) points out the reduction in financial intermediation costs, the possibility of arbitration between markets in different countries, diversification of protection instruments, and greater accuracy in pricing risks by engineering. For the author, financial engineering is the *"creation of new customized products to meet the needs of customers"* (Pinheiro, 2016, p. 111). For this purpose, it combines application and funding instruments with the unfolding and regrouping of cash flows, creating new securities to meet the agents involved. Frame; White (2004) states that financial innovations enable costs and risk reductions, improving the PS available on the financial markets.

Innovations in the financial industry also result in lower costs, economies of scale, reduced transaction costs, and information asymmetry (FSB, 2019). Examples of innovations that can affect the relationship between banks and FinTechs are the Open Banking and Credit Scoring. The first is a system in which financial institutions and users share data through the Application Programming Interfaces (APIs) (FSB, 2019). Anagnostopoulos (2018) points out that these APIs will allow new entrants to force banks to assume lower profit margins by sharing information between agents, reducing information asymmetry. With regard to Credit Scoring, Akhavein et al. (2005)

emphasize that these technologies can affect the price of credit and increase credit availability, mainly for small businesses.

Although innovations spread to different industries after their initial adoption stages, some sectors have traditionally been at the vanguard of these innovations. Regarding the adoption of IT, Barras (1990) define the financial industry as a vanguard sector in this type of technology and adds that the vanguard sector is more important than the technology itself. However, the catch-up of the new technology by the vanguard sector requires technological opportunity, market conditions, and the favorable structure of the industry.

Concerning the replacement of incumbents by FinTechs, the author is more pragmatic. Presenting a timeline of the banking innovations since the 60s, he argues that, in a Schumpeter Mark I and II model, they will interact between themselves (incumbents and new) to achieve profitable results. Further, he adds that these new and small companies are a component of the “division of labor” faced with lower entry costs, which allow them to operate in the traditional manner of the Schumpeter I model and provide the dynamics of economic development.

Concerning the protection of the ownership of innovations, although the financial industry is a vanguard sector to new technologies (Barras, 1990), it works in a weak appropriability regime (LERNER, 2006; LÓPEZ; ROBERTS, 2002). This condition easily allows imitation and replication of their PS because this industry has not a tradition of copyright, trade secret laws, or even patent-related protection.

Finally, the adoption and diffusion of innovations in the financial industry are also related to advantages in shorter lead times to introduction of new PS (Akhavein et al., 2005; López; Roberts, 2002), adoption delay by large financial companies (Frame; White, 2004), and the relationship between profits and innovations in small firms (LERNER, 2006).

2.4 BRAZILIAN FINANCIAL INDUSTRY

Banks are part of the financial market, which combines activities from the flow of resources between participating agents through specific regulation (Cherobim et al., 2017). In this market, the primary function of banks is financial intermediation: to enable the flow of resources from surplus agents (savers) to deficit agents (debtors).

2.4.1 Financial Institutions and Full-Service Banks

The financial industry is the group of companies and institutions that pertains to the financial system of a specified country. Similarly, the financial system is the market set and institutions that drivers the savings from the surplus (creditors) to deficit (debtors) agents (PINHEIRO, 2016). The incumbent banks are the traditional banks already existent before the FinTechs.

In sum, Financial institutions are companies that intermediate financial resources. In Brazil, Law 4,595 (12/31/1964) defines them as “*public or private corporate persons that have as their major or accessory activity the gathering, intermediation or investment of their own or third-party financial resources in national or foreign currency, and custody services of assets belonging to third parties.*” In turn, Pinheiro (2016) adds that financial companies transform and exchange financial assets, assist their customers in the process of creation of these assets, and manage the portfolio of other market participants.

Strictly speaking, banking institutions are a category of financial institutions that pertains to a monetary subsystem. However, the crucial difference between banking and non-banking financial institutions is the right to issue currency (scriptural money) by collecting demand deposits from their customers. Using (in part or in whole) resources from these deposits, banking institutions can offer loans and, consequently, issue scriptural money.

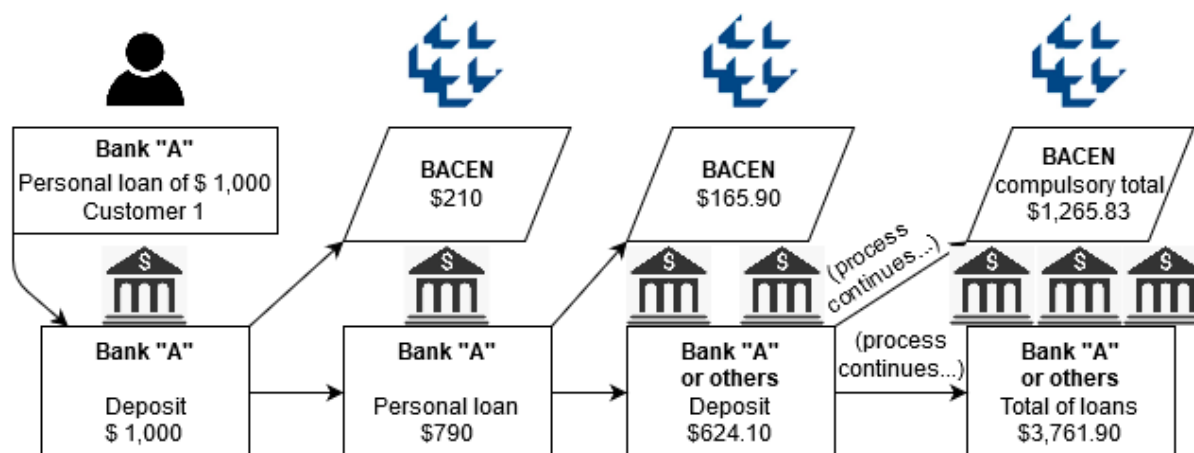
In March/2020, banks need to maintain at their Reserves Account (BACEN) 21% of the balance of the demand deposits held by its customers on their deposit accounts, according to Circular Nº 3917, of November 22, 2018. Measures such as this aim to restrict the uncontrolled expansion of means of payment. At the same time, however, they allow approximately 79% of demand deposits to be lent to other account holders; accord to a specific destination².

Although the BACEN is in charge of the primary currency in Brazil, commercial and banking institutions can multiply the resources in demand accounts through its percentual of 79% (100% minus 21%), a mechanism known as monetary multiplier. In a hypothetical situation where banks lend the total of demand deposits, an initial deposit of \$ 1,000 creates an additional amount of \$ 3,761 in the financial system, in

² It is important to note that after march 2020 many rules to restrict the bank deposit multiplier power are relaxed in order to give liquidity to market during the COVID-19 Crisis BACEN (2020).

addition to the initial value of \$ 1,000. In this hypothetical situation, the multiplier is 4,76 (1/0,21). We recall that in the Brazilian financial industry, other types of financial companies also are called “banks”. However, they do not multiply money using the multiplier mechanism because they do not keep demand checking accounts. We illustrate this phenomenon in Figure 6.

FIGURE 6 – MONETARY MULTIPLIER IN BRAZIL



SOURCE: The Author (2020)

By intermediating resources, banks pay interest rates on surpluses and earn interest on deficits. The difference between the rates is the spread. Thus, intermediation performs a double function: it serves both agents who need resources to fulfill their obligations and those who seek remuneration for their capital. Pinheiro (2016) adds that this intermediation means an evolution of the economy beyond the direct exchange between agents.

Financial transactions also can be carried out without the interference of banks. However, according to Cherobim et al. (2017), the complexity of this process requires a structure to facilitate the flow of resources and the dynamics of other elements (e.g., interest rates and administrative costs).

This exemption may occur when saving agents and investors present specific demands, such as intermediation of terms, insolvency, and stochastic risks (PINHEIRO, 2016). With the direct placement of securities among investors, the author warns that intermediation has lost importance with the emergence of agents such as institutional investors, for example. This fact can cause essential changes in securities markets and financial intermediaries.

In addition to financial intermediation, banks perform other functions in society, such as: offering access to payment systems, asset transformation, risk management,

and information processing and monitoring of borrowers (FREIXAS; ROCHET, 1999). Following the Oliveira; Von Hippel (2011) classification, the present work defines checking, savings, time deposits, and loans as the “core activities” offered by incumbent banks.

In Brazil, the five biggest banks (BACEN, (2019a) in the present work scope are Full-service banks, offering PS under the same conglomerate structure. These banks have broad portfolios and can act as commercial and investment banks at the same time. Besides, they offer services of asset management, customer loans, leasing, insurance, and real state financing, for example.

2.4.2 Non-Banking Companies

The Brazilian financial industry scenario for digital banks has started to change after the Law Nº 12,865/2013 that regulates the payment schemes and payment institutions as part of the Brazilian Payment System (Sistema de Pagamentos Brasileiro - SPB). This regulation creates the concepts of payment arrangement, payment institution, payment account, payment instrument.

- Payment scheme: the set of rules and procedures that regulate specific services to customers. This service is accepted for more than one beneficiary through direct access by end-users, payers, and beneficiaries.
- Payment scheme settlor: organize the payment scheme and use the associated brand – such as credit card brands.
- Payment account: account for register owned by the end-user of payment services to perform payment transactions.
- Electronic money (e-money): resources kept in Brazilian Reais (R\$) device or electronic system that allows the end-user to perform a payment transaction.
- Payment institution: institution in one or more payment schemes allowed to manage payment accounts, make available the service of deposit/transfer kept to/from payment accounts, issue payment instruments, acquire payment instruments, and convert physical or scriptural currency in e-money (or vice versa). Although the Credit Guarantee Fund (FGC) does not guarantee the money stored in

payment accounts, as occurs in checking accounts, it must be deposited in BACEN or invested in Brazilian Treasury bonds.

Beyond this categorization, the Circular Nº. 3.885/2018 divides payment institutions into three levels:

1. E-money issuer: payment institution that manages the prepaid payment account of end users, makes e-money transactions available, and converts the funds held in these accounts into physical or book-entry money or vice-versa.
2. Post-paid payment instrument issuer: payment institution that manages a postpaid end-user payment account and provides payment transactions based on that account;
3. Accrediting institution: payment institution that, without managing payment account a) qualifies recipients for acceptance of a payment instrument issued by a payment institution or by a financial institution participating in the same payment scheme; and b) participates in the process of settling payment transactions as a creditor to the issuer, following the rules of the payment scheme.

Most Brazilian digital banks are payment institutions that act as an e-money issuer or post-paid payment instrument issuer. These institutions can not apply the resources of customers in credit transactions. All such resources must be held in an account at the BACEN. Although these institutions convert physical or scriptural money to e-money, they do not create scriptural money as banking institutions. That is the most striking difference between payment institutions and banks in Brazil.

Based on the above rules and concepts, we define payment institutions as a type of financial institution that can manage pre-paid and post-paid accounts not able to create scriptural money and act as accrediting institutions. Although the trade name of payment institutions usually includes the expression “bank”, they can not use resources maintained as e-money by their customers to create scriptural money. Then, under the Brazilian legislation (Law Nº. 4,595 of 12/31/1964), these companies are not considered banks. Some examples include Nubank, Pefisa, and Super Digital³.

³ Source: https://www.bcb.gov.br/estabilidadefinanceira/relacao_instituicoes_funcionamento - access on 03/23/2020

The **first category** of banks we choose is the **incumbent banks**. Although official statistics report 155 banks operating in Brazil (Figure 9), the Brazilian financial market is highly concentrated. The five-largest banks are Itaú, Bradesco, and Santander (private) and the Banco do Brasil (BB) and Caixa Econômica Federal (CEF - controlled by the Brazilian Government). These five banks concentrate 69.8% of the total assets, credit operations, and total deposits of citizens, companies, and governmental institutions.

Another characteristic is that these five companies are Full-service banks, operating with a broad PS portfolio (including non-financial) in the same structure. In Brazil, Full-service banks concentrate 90% of the total assets of the financial system (BACEN, 2018a). Section 2.4.3 - Bank Concentration in Brazil describe more details about this concentration.

Considering this rate of concentration and the size of the portfolio, we choose these five largest banks as the source of data and basis of comparison with other financial organizations in this work. Since these banks are full-service banks and concentrate almost 3/4 of the financial market, we also intend that they represent the Brazilian incumbent banks for this research.

The **second category** of companies is composed of eight self-entitled digital banks that we call “**digitalized banks**”. We call these banks digitalized because they are not “digital-born”; they are small or medium-sized banks created before the FinTechs. These banks are allowed to keep demand deposit accounts and perform credit operations. They are Agibank, Banco Inter, Banco Original, Banco Renner, BS2, C6 Bank, Modal Mais, and Sofisa Direto. The first one (Agibank) is a commercial bank, and the other seven are registered as are Full-service banks, according to BACEN.

The criteria for the choice of these eight digital banks are: self-entitlement as digital, register in BACEN as an institution authorized to maintain customer amounts in bank demand deposit accounts, allow customers to payment of bills (e.g., Brazilian boleto); register in BACEN as Commercial or Full-service bank, and availability to open accounts via internet or mobile phone app.

It is essential to explain the PS called “Brazilian boleto”, established in 1993 through Circular 2,414/1993, published by BACEN. It is a document similar to a bank slip used by companies for Business-to-customer (B2C) and Business-to-business (B2B) bills. Some of its essential information includes issuer name (beneficiary), payer, amount, and due date. The boleto can be paid at any bank branch, even if the issuer

has an account at a different bank. Boleto data has a standardized bar code (CNAB 400), which can be read by a bar code reader in banking terminals or even using a smartphone camera. After the payment, the amounts are sent to the beneficiary the same day or the following day.

Boleto deposit replaces the need to deposit values in an account specifically at the same bank branches where the beneficiary maintains their account. Since digitalized and digital banks do not have “brick and mortar” branches, they converted an already existing billing alternative (Brazilian boleto) to address their lack of a banking service network.

The **third category** is composed of nine **payment institutions**, known in Brazil as **Digital Banks**. Although they are called digital banks, they can not maintain demand deposit accounts and do not create scriptural money, the reason why we refer to them as “payment institutions”. These companies are covered by Law Nº 12,865/2013 and authorized to manage payment accounts. Most of their services involve deposit/transfer kept to/from payment accounts, issue payment instruments, acquire payment instruments, and convert physical or scriptural currency in e-money (or vice versa).

The criteria for the choice of these companies are: do not keep demand deposit accounts, be self-entitled as “digital bank”, manage pre-paid or post-paid payment accounts, and keep available on the internet or mobile phone app the option to open and manage an account. The approval of BACEN to this type of company is mandatory only for such institutions with more than R\$ 500 million in payment transactions or R\$ 50 million in resources maintained in pre-paid accounts.

This work contemplates all the payment institutions with mentioned characteristics existing in Brazil, as shown in Figure 7.

FIGURE 7 – PAYMENT INSTITUTIONS

<i>Name</i>	<i>Category according regulation</i>	<i>Cadastro Nacional de Pessoas Jurídicas (CNPJ)</i>	<i>Foundation</i>	<i>BACEN permission</i>
Banco Maré	Payment institution	IT Consulting	ago/16	No
BanQi	Payment institution	Other auxiliary activities of financial services not specified previously	jun/18	No
Hugpay	Payment institution	Financial institutions correspondents	jul/10	No
Livre	Payment institution	Credit card management	jun/17	No
Nubank	Payment institution	Credit card management	jun/13	Yes
Pefisa (Pernambucas)	Payment institution	Credit, financing, and investment companies - financial companies	mar/80	Yes
Pinbank Brasil (Cacau Pay)	Payment institution	Other service activities provided mainly to companies not previously specified	out/12	No
Social Bank	Payment institution	Brokerage and business intermediation activities in general, except real estate	nov/15	No
Superdigital	Payment institution	Credit card management	May/08	Yes

SOURCE: The Author (2020)

Figure 8 summarizes the selection criteria, the number of resulting companies and the approximate percentage representativeness of these companies for the financial market within their category.

FIGURE 8 – THREE CATEGORIES OF BANKS AND CRITERIA FOR CHOICE

<i>Type of company</i>	<i>Incumbent banks</i>	<i>Digitalized</i>	<i>Digital banks</i>
Source	BACEN	Web search / BACEN	Web search / BACEN
Crtery 1	Registered as a full-service bank	Self-entitlement as digital bank	Self-entitlement as a digital bank
Crtery 2	Ranked in the top five by total assets	BACEN authorization to maintain demand deposit accounts	Do not keep demand deposit accounts
Crtery 3		Register in BACEN as commercial or full-service bank	Manage pre-paid or post-paid payment accounts
Criteria 4		Availability to open accounts via internet/app	Available to open and manage accounts via internet/app
% of Market availability*	69,8%	100%	100%
Number of Brazilian companies	155 (oct/20)	Nine (may/20)	Nine (may/20)
Final result			

* Number of institutions that we analyze in this work according to the criteria described

SOURCE: The Author (2020)

2.4.3 Bank Concentration in Brazil

Although the Brazilian financial industry has Full-service banks as its main characteristic, several types of financial institutions (e.g., commercial banks, credit unions, and investment banks) are listed. In October 2020, BACEN reported 155 institutions listed in Figure 9.

FIGURE 9 – FINANCIAL INSTITUTIONS IN BRAZIL ON OCTOBER/2020

<i>Category of Financial Institution</i>	<i>Quantity</i>
<i>Full-service bank</i>	133
<i>Commercial bank</i>	14
<i>Exchange Bank</i>	5
<i>Full-service cooperative bank</i>	2
<i>Federal savings bank</i>	1
<i>Total</i>	155

SOURCE: https://www.bcb.gov.br/estabilidadefinanceira/relacao_instituicoes_funcionamento - access on 11/17/2020

The financial industry in Brazil is characterized by its level of concentration. According to BACEN (2018a), the five largest banks concentrate 69,8% of total assets, credit operations, and total deposits in Brazil (December/2019). Regarding the characteristics of banking concentration in emerging countries, Zhang et al. (2013) affirmed, through studies that relate banking concentration and performance, the argument of preference for a "quiet life." In this concept, firms with market power operate inefficiently, and managers can relax their competitive efforts, taking advantage of the profits of a monopoly market structure.

As far as we know, there is no literature analyzing the impact of FinTechs on banking concentration in the Brazilian financial industry. However, BACEN (2019a) examines the effects of reductions in the number of banks in Brazilian cities between 2005 e 2015, which may indicate some impacts of the changes in banking concentration. In the BACEN study, these reductions occurred as effects of banking Mergers and Acquisitions (M&A) and the institution concludes that:

- Cities with branch closures present a decrease in credit balance and an increase in bank spread to companies when compared to cities without closures of branches. This result is more pronounced in analyzed cities with few banks before the M&A;
- The effects of bank closure in a local market disappear in places with six or more banks before the M&A;

- Cities with only one bank participant of a M&A process (without no variation in competition) presents a decrease in bank spread when compared to cities without banks involved in M&A. BACEN (2019a) concludes that this result may indicate a possible efficiency gain by the M&A participating bank.

Although the BACEN study does not involve FinTechs, the results suggest that the reduction in bank concentration in Brazil may positively impact customers in terms of bank spread and volume of credit. As FinTechs also diversifies the financial industry scenario, these new companies can also show positive outcomes to customers regarding the competition.

For Zhang et al. (2013), the history of Brazilian hyperinflation allowed banks to take advantage of the profitability of short-term operations (float) and reduced incentives to develop regular banking practices. They add that the annual average spread (the difference between the cost of raising funds and the interest paid by borrowers) achieved 38% in Brazil between 2003 and 2010. In the same period, Russia, India, and China, other BRIC countries, recorded average spreads of 6%, 5%, and 3%, respectively. Almeida; Divino (2015) stated that this spread contributes to the combination of a low percentage of loans compared to GDP and high-interest rates of credit operations.

2.4.4 Brazilian Financial Market Overview

The inflationary rates in Brazil reached a maximum of 2,596% in 1990, a phenomenon characterized by an inertial element (Lacerda et al., 2005). Consequently, Brazilian banks needed to optimize their systems to update the interest rates paid and received from customers.

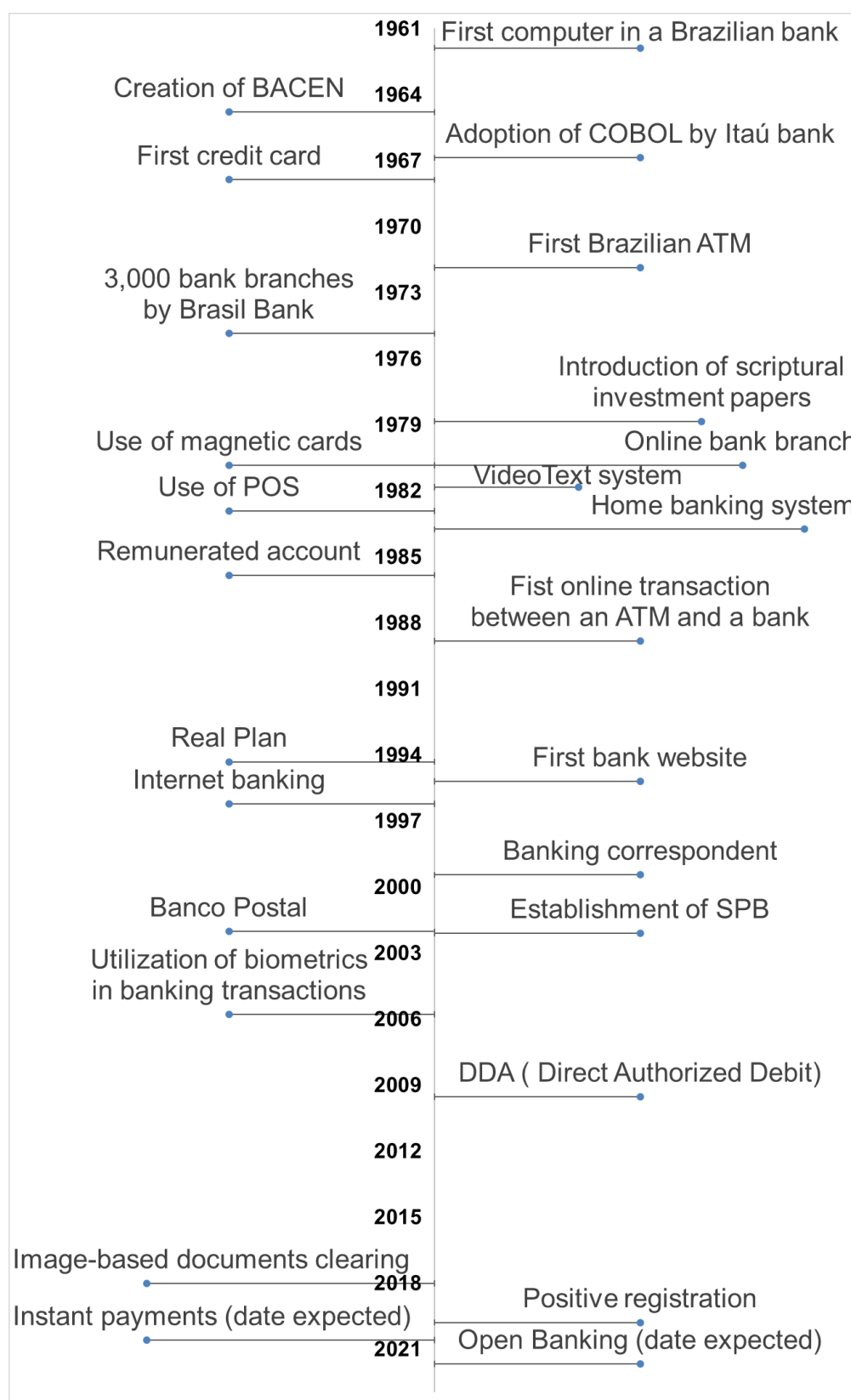
The Informatics Law of October/1984 was one of the first reasons for concentration. It was a legal and technological driver because it restricted the use of foreign equipment, technology transfer, and foreign involvement in the Brazilian IT industry and created a market reserve for the Brazilian IT industry.

Such factors compelled IT technicians of Brazilian banks to develop hardware/software solutions and develop banking products to deal with these issues (Fonseca et al., 2010). A stronger motivator was the Real Plan, launched in mid-1993 and consolidated in 07/01/1994. It was a set of economic measures that contributed to reducing these high inflationary rates and assisted in economic stabilization.

Before, the high inflation and interest rates have allowed wastes and operational losses to private and public banks. After Real Plan, it was necessary to optimize processes, to charge services, and to look for other sources of rentability, besides inflationary speculation.

Thus, since the purchase of the first computer by a Brazilian bank in 1962 until the launch of positive registration to credit customers, the financial industry in Brazil has seen a considerable number of changes. Although the first of these technologies dates back to 1961, only one is no longer used (e.g., video-text system). We illustrate some of these events in the Brazilian financial industry in Figure 10.

FIGURE 10 – TECHNOLOGICAL, LEGAL, AND ECONOMIC EVENTS IN BRAZILIAN FINANCIAL INDUSTRY



SOURCE: Fonseca et al. (2010); <https://portal.febraban.org.br/pagina/3051/1088/pt-br/dda>;
<https://www.bcb.gov.br/en/financialstability/paymentsystem>; <https://www.tecban.com.br/sobre-nos/>
<http://museubradesco.org.br/pages/galeria/albuns/bradesco.html>;
<http://museubradesco.org.br/sources/pdf/revista-museu7.pdf>;

<https://www.itl.gov.br/noticias/indice-de-noticias/2310-compe-por-imagem-compensacao-de-cheques-de-todos-valores-levara-um-dia-util> (accessed between March 24 and 28/2020)

Between 2013 and 2019, we find 15 new PS using new technologies available in the market, as shown in Figure 11.

FIGURE 11 – MARKET LAUNCH DATE OF 15 PRODUCTS AND SERVICES

PS	Product launch on the market	Company that launched the product	Description
Check deposit by photo	June/2013	Bradesco	Check deposit into customer account using picture taken by mobile phone
Financial transactions by SMS	June/2013	BB	Allow customers to carry out their banking transactions through SMS service of mobile phones
Payments account	November/2013	Nubank	Account for register owned by the end-user of payment services to perform payment transactions allowed by the law 12.865/13.
Virtual Credit Card	August/2014	BB	A safer version of credit card for online shopping where the verification data changes dynamically.
Deposit by boleto	December/2016	Banco Inter	The adaptation of an existing technology (Brazilian boleto payment) to a different goal (deposit in a bank account)
Currency lock on international shopping with USD	June/2016	Caixa	Service that allows the costumers that, when purchasing with their international credit card, pay they shopping for the same value of the dollar in the day of the purchase, and not in the date of the due date of the credit card bill.
Discounts for advance payment of credit card bills	December/2016	Nubank	The institution makes a credit in cash to the account of the customer when the customer anticipates future installments to be due on the credit card
Bill splitting (Racha de conta)	May/2017	Superdigital	Allows users to split the bill in restaurants or other similar occasions with friends and family via text messaging service
Payments using QR Code	September/2017	Banco Inter	Payments using QR Code reading on smartphones
Money transfer using QR Code	September/2017	Banco Inter	Money transfers and receiving between deposit accounts using QR Code reading on smartphones
P2P Lending	October/2017	Social Bank	Product that allow investors to directly finance credit borrowers individually or collectively without bank intermediation.
Money transfer using mobile phone contacts	December/2017	Banco Inter	Money transfers using the contacts in the phone book that are also clients of the same bank
Social group for contributions collection	February/2018	Social Bank	Sharing a payment account among people with options such as goals of amounts to be achieved, setting dates to achieve the goal, adding or removing people and defining what each person can do within the account.
Account division according to client purposes	September/2018	Nubank	It allows the customer to control and manage the money he spends on a daily basis, to pay bills, make transfers, and also invest the money.
Toll payment	June/2019	Banco C6	Offer a toll tag with no monthly fee
Deposit account in USD	November/2019	BS2	Deposit account in local currency and foreign currency (USD)

SOURCE: The Author (2020) based on information from the Appendix B

It is worth commenting on open banking and instant payments (PIX) to be implemented in the future in Brazil. ⁴Open banking is the sharing of data on PS offered by participating institutions, customer personal data, customer transactional data, and payment services, through the opening and integration of platforms and infrastructures of information systems (BACEN, 2019; 2020)".

The BACEN aims to use the Open Bank to increase the efficiency in credit and payments markets in Brazil, to create a more inclusive and competitive business environment while preserving the security of the financial system and ensuring the protection of consumers (BACEN, 2019).

The Open Banking includes sharing data on PS offered by participating institutions, customer personal data, customer transactional data, and payment services. The implementation will be in four stages, starting on 11/30/2020 and expected to finalize on 10/25/2021.

2.5 FINTECHS

Accord to Freixas; Rochet (1999), financial intermediaries act as *"economic agents who specializes in the activities of buying and selling (at the same time) financial contracts and securities"* (Freixas; Rochet, 1999, p. 15). The authors add that the definition of intermediary (or retailer) comes from the Industrial Organization theory and is justified by frictions in transaction technologies (transportations costs).

These new companies offer innovative solutions based on IT to improve the financial activities (Alt et al., 2018; Arner et al., 2015; BACEN, 2018; Chen et al., 2019; Puschmann, Thomas, 2017; Schueffel, 2016). According to the literature, FinTechs companies can impact the financial Market and the incumbent institutions, which results in new business models, processes and products (FSB, 2017). Gromek (2018), IMF (2019), and Milian et al. (2019) argue that the concept lacks a consistent definition.

BACEN presents the concept of FinTechs as a correction of imbalances because these companies identify obsolescence and omissions in the financial market, developing innovative solutions in response (offer) (BACEN, 2018). FinTechs are also examples of financial innovations that perform different activities in the financial market. Some examples of categories of FinTechs are: loan technology; personal

⁴ The implementation of PIX began in October 2020, during the finalization of the writing of this thesis. Therefore, its impact is not being considered in the analysis.

finance and asset management; value transfers; Blockchain and Cryptocurrencies; institutional technology; capital markets; and crowdfunding (Milian et al., 2019).

For the present work, FinTechs are characterized as incremental financial innovations because they improve and diversify financial services. However, they also can be characterized as radical financial innovations because they eliminate some traditional financial services. The most apparent categorization is about FinTechs as service providers similar to traditional financial agents (e.g., credit, collection, and investments), but using new technologies and differentiated means of interaction with the target audience.

These activities are similar to a fragmentation of the PS offered by multiple banks. Therefore, FinTechs perform separately traditional functions from the incumbent banks, which can generate changes in the competitiveness of the financial market due to the entry of financial companies based on this new business model.

Thus, customers that depend on the financial market do not need to acquire a vast offer of PS if they individually demand only one of these items. This segregation is cited by Anagnostopoulos (2018) as a new paradigm in the financial market, as it allows FinTechs to specialize in specific segments, providing recognition from consumers and market share. The author states that banks as institutions will not disappear in the future. However, many services performed by them may serve as a basis for new FinTechs. FSB (2019) adds that technology is the element that allows the segmentation of the activities of these companies.

Although it is not the object of the present study, it is essential to highlight the incipient participation of cryptoassets in financial intermediation. Despite being insignificant compared to total assets in the international monetary system, the negotiation of cryptoassets (e.g., Bitcoin) can eliminate the role of governments as currency guarantors and go beyond the geographical boundaries of the agents involved in the transaction. This potential elimination of the role of the government opens gaps in the regulation, acceptance, and use of these assets as a reserve of value or means of exchange for transactions in the market.

2.5.1 Inducing Factors of FinTechs

Three factors contributed to the emergence and growth of FinTechs. The first is the emergence of new technologies such as Big Data, Distributed Ledger Technology (DLT), Cloud Computing, Artificial Intelligence and Machine Learning

(Basel Committee on Banking Supervision, 2018; P Gomber, Koch, & Siering, 2017; IMF, 2019; Jagtiani & John, 2018). These innovations enable the processing of higher volumes of information, increased storage capacity, and automation of decisions in the financial sector (He et al., 2017), traditionally characterized as the vanguard in the application of ‘information technology’ innovations (Arner et al., 2015; BARRAS, 1990). This technological progress has generated changes in financial products, services, production processes, and organizational structures (Frame et al., 2018). The second factor was the decrease in consumer, business, and government confidence in the large banking institutions after the 2008 financial crisis (Arner et al., 2015; Larsson et al., 2017) and the need to reduce the concentration of transactions in large banks. The third factor is associated with adopting new technologies by consumers, especially the new generation of digital natives (BASEL COMMITTEE ON BANKING SUPERVISION, 2018).

In a chronological sequence, Arner et al. (2015) describe three main stages of the innovations in the financial industry that contributed to the emergence and evolution of FinTechs, as shown in Figure 12.

FIGURE 12 – STAGES THAT CONTRIBUTED TO THE EMERGENCE OF FINTECHS

Description	Time period	Landmarks	
		Beginning	End
FinTech 1.0	1866-1987	First transatlantic cable	Global stock market crash
FinTech 2.0	1987-2008	Stock market crash in the U.S.A.	2008 Financial crisis
FinTech 3.0	2008-present	2008 Financial crisis	-

SOURCE: Arner et al. (2015)

Among these periods, it is noteworthy to cite the transition from analog to digital technologies (around 1967) and the creation of FinTechs by financial industry workers that lost their jobs during the 2008 financial crisis.

Despite the market and consumers witnessing FinTechs as an example of digital-based financial companies, the exclusive use of digital channels may not be as new as they might think. One of the previous experiences of internet-only banks, an antecedent of FinTechs, is described by Frame; White (2014, p. 500). “*The dramatic increase in individuals’ use of the Internet in the 1990s created the possibility of a new organizational form in banking: the Internet-only bank*”.

Delgado et al. (2007) report that in mid-year 2002, there were thirty-two Internet-only banks in Europe and another twenty in the US. While in Europe almost all of these companies affiliate with existing institutions, in the U.S.A., they were

exclusively digital. However, this type of company has disappeared or created physical spaces to serve its customers, demonstrating that “clicks and mortar” is the dominant technology (FRAME; WHITE, 2014).

2.5.2 Banking Regulation in the Brazilian Financial System (SFN)

This section analyzes the current legislation and initiatives to demonstrate how the relationship between the incumbent, digitalized, and digital banks in the Brazilian banking industry can occur.

One of the arguments that support this approach is *"In fact, it is practically impossible to study the theory of banks without referring to banking regulation"* Freixas; Rochet (1999, p. 257). The authors also point out that market power, the importance of externalities, and asymmetric information between buyers and sellers justify banking regulation.

In Brazil, the activities of FinTechs began to be regulated by Law No. 12.865, of 10/9/2013. In this law, new guidelines defines the means and arrangements of payments, such as the interoperability of capture terminals to promote competition.

Subsequently, the performance of P2P Lending companies was regulated. BACEN (2018b) drafted Resolution No. 4,656, on 04/26/2018, which creates the Direct Credit Society (SCD – *"Sociedades de Crédito Direto"*) and the Peer-to-peer Loan Company (SEP – *"Sociedades de Empréstimos Entre Pessoas"*).

The critical difference between these two types of companies is in their fundraising. While SCD must carry out operations only with its capital, SEP acts as a mediator of resources of individuals/legal entities, financial institutions, and securitization companies, not supporting their resources. In addition to these requirements, the SCD and the SEP are qualified for loans only via electronic platforms.

The third initiative appeared when BACEN (2019b) disclosed the objectives of *Open Banking* in Brazil through communication No. 33.455. BACEN (2019b, p. 4) defines Open Banking as

"the sharing of data, products, and services by financial institutions and other authorized institutions, at the discretion of their clients, in the case of data related to them, through the opening and integration of information systems platforms and infrastructures, in a secure, agile and convenient manner".

The institution emphasizes the objective of increasing efficiency in the credit and payment market, with a more inclusive and competitive business environment. Products and services, registration/transactional data, and payment services (e.g., transfers) are some data to be shared. Its introduction is expected in the second half of 2020.

Finally, *Receita Federal do Brasil* (RFB) established the Normative Instruction Nº. 1,888 about Cryptoassets (including the Bitcoin), defining they as

"the digital representation of value denominated in its unit of account, whose price might be expressed in local or foreign sovereign currency, traded electronically with the use of cryptography and distributed registration technologies, which may a form of investment, an instrument of value transfer or access to services, and which does not constitute legal tender" RFB (2019, p. 2).

This legislation provides rules on collecting taxes but does not present this category of assets as a means of payment or value reserve. Other Brazilian initiatives that can affect FinTechs include Ordinance about Instant Payments (Nº. 102,166), public consultation Nº 75/2019 regarding the interoperability of Automated Teller Machines (ATMs), the *Lei Geral de Proteção de Dados* (LGPD) (Nº. 13,709/2018) about personal data protection, and the Public Hearing Nº. 05/19 from *Comissão de Valores Mobiliários* (CVM) about the regulatory sandbox.

2.5.3 FinTechs in Brazil

It is essential to point out the differences when analyzing competition between the incumbent, digitalized, and digital banks. With some exceptions, we aim to concentrate the research on the characteristics and differences of PS offered by these companies. We are aware that, considering the emergence and the smaller size of most digital banks compared with the five biggest incumbent banks, these two categories have structural differences that influence the comparison between them. We can see an example when analyzing newspaper articles. Sometimes, newspaper reports are refer to digital banks as FinTechs.

In Brazil, two of the most known data sources about FinTechs, coordinated by two organizations in the industry, estimate between 432 and 550 of such companies in Brazil. In such studies, FinTechs grouped according to different categorization

methodologies. However, a common feature of the cited data sources is the prevalence of payment companies, as shown in Figure 13.

FIGURE 13 – QUANTITY OF FINTECHS IN BRAZIL

Survey release	Survey Publisher	Number of FinTechs	Categories	Quantity
jun/19	FintechLab ¹	529	Payments	151
			Lending	95
			Financial management	90
			Investments	38
			Insurance	37
			Cryptocurrency	36
			Funding	25
			Debt negotiation	19
			Exchange and remittances	14
			Digital banks	12
			Multiservice	12
jan/19	ABFintechs (Associação Brasileira de FinTechs) / Sebrae ²	432	Payment options	88
			Exchange, credits, financing, and debt negotiation	68
			Financial efficiency	68
			Financial management	61
			Others	49
			Investment management	29
			Digital banks	22
			Digital coins & blockchain	20
			Crowdfunding	15
			Insurance	12

SOURCE: 1) <https://fintechlab.com.br/wp-content/uploads/2019/06/Radar-tc.jpg>

2) <https://bit.ly/2PBcEmP> (accessed in 03/24/2020)

More precise surveys on the quantity of Fintechs in Brazil are hard to obtain because these companies do not yet have a specific code for classification in the National Register of Legal Entities (CNPJ), similar to the Employer Identification Number (USA). Then, Brazilian FinTechs presents generic CNPJ classifications as IT Companies or Service Provision, for example. Although some digital banks are registered in the CNPJ category as banks, they have no other differentiation than digital.

Regarding the Market value of Brazilian FinTechs, in March 2020, two are valued over US\$ 1 billion (CB INSIGHTS, 2020). The first is the Nubank (US\$ 10 billion), which offers payment accounts, credit cards, personal loans, and a rewards

program. Ebanx (US\$ 1 billion), the second company, provides payment solutions for companies and achieved a market value above US\$ 1 billion in October 2019.

Not all FinTechs have specific regulations or need to have their operations regulated by Brazilian law. For example, Circular 3,885/2018 regulates payment institutions. Then, only such companies with more than R\$ 500 million in payment transactions (on the last 12 months) or R\$ 50 million in resources maintained in pre-paid accounts need to request approval to perform their activities. In February 2020, the website of BACEN shown 20 payment institutions, nine SCD, and three SEP under Brazilian regulation, as shown in Figure 14.

FIGURE 14 – PI, SCD, AND SEP COMPANIES REGISTERED IN BACEN IN FEBRUARY/2020

Name	Segment	Foundation
Credi Shop Sa Administradora De Cartoes De Credito	PI	May/1990
Sorocred Meios De Pagamentos Ltda.	PI	Sep/1990
Repom S.A.	PI	Jan/1993
Cielo S.A.	PI	Dec/1995
Redecard S.A.	PI	Sep/1996
Pagseguro Internet S.A.	PI	Sep/2006
Wirecard Brazil S.A.	PI	May/2007
Gerencianet Pagamentos Do Brasil Ltda	PI	Sep/2007
Super Pagamentos E Administração De Meios Eletrônicos S.A.	PI	May/2008
Getnet Adquirência E Serviços Para Meios De Pagamento S.A.	PI	Oct/2008
Mercadopago.Com Representacoes Ltda.	PI	Dec/2008
Paypal Do Brasil Servicos De Pagamentos Ltda.	PI	May/2009
Acesso Soluções De Pagamento S.A.	PI	Jan/2011
Bpp Instituição De Pagamento S.A.	PI	Feb/2011
Agillitas Soluções De Pagamentos Ltda.	PI	May/2011
Stone Pagamentos S.A.	PI	Jun/2012
Nu Pagamentos S.A.	PI	Jun/2013
Adiq Solucoes De Pagamento S.A.	PI	Jun/2014
Boletobancário.Com Tecnologia De Pagamentos Ltda.	PI	Jun/2014
Cartos Sociedade De Crédito Direto S.A.	SCD	Nov/2014
Bolt Card Credenciadora De Cartao De Credito Ltda	PI	Jun/2017
Qi Sociedade De Crédito Direto S.A.	SCD	Jan/2019
Creditas Sociedade De Crédito Direto S.A.	SCD	Jun/2019
Hb Capital - Sociedade De Crédito Direto S/A	SCD	Jun/2019
Mova Sociedade De Empréstimo Entre Pessoas S.A.	SEP	Jun/2019
Listo Sociedade De Crédito Direto S.A.	SCD	Jul/2019
Nexoos Sociedade De Empréstimo Entre Pessoas S.A.	SEP	Jul/2019
Ótimo Sociedade De Crédito Direto S.A.	SCD	Jan/2019
Bmp Money Plus Sociedade De Crédito Direto S.A.	SCD	Jul/2019
Stone Sociedade De Crédito Direto S.A.	SCD	Aug/2019
Tanger Sociedade De Crédito Direto S.A.	SCD	Sep/2019
Up.P Sociedade De Empréstimo Entre Pessoas S.A.	SEP	Jan/2020

Notes: PI - Payment Institution; SCD – Direct Credit Society; SEP – Peer-to-Peer Loan Company

SOURCE: https://www.bcb.gov.br/estabilidadefinanceira/relacao_instituicoes_funcionamento - access on

03/23/2020

2.5.4 Types of products and services offered by FinTechs

To analyze the impact of these new types of companies in the financial industries, it is initially necessary to determine metrics and elements that compare the PS of the incumbents and these new categories of firms. The categories used by comparison are a common issue and, at the same time, an essential element in the

competition analysis. Personal finance, loan technology, insurance, and cryptocurrencies are some examples of FinTechs categories.

P2P lending companies are examples of FinTechs on the loan technology category. Loans handled by these companies are business models that allow investors to finance credit borrowers individually or collectively directly. The innovation of this model is that the same loan can be granted by several people and without banking intermediation (IOSCO, 2017).

To address the categorization issue, we use the content analysis as a (qualitative research method) and cluster analysis (quantitative research method) generated from network data to define standard categories to compare the PS between the five biggest Brazilian incumbents banks and the FinTechs. The final result is a nine categories framework that can be used to classify the banks and the FinTechs in the same categories to analyze the relationship between them. We detail the results in the Appendix A.

To the best of our knowledge, there is little research in the literature that presents a standard definition of the FinTechs categories broadly used by researchers. Then, the authors use to classify these companies according to the objectives of their works or following almost intuitive definitions, most of the time adopting the classification already existent in the traditional financial system.

Gromek (2018) describes some difficulties in the FinTechs categorization and conceptualization that arise because these enterprises can serve the final customers or other companies. Due to the complexity of classification, the author argues that the same FinTech pertains to more than one category (ex. lending and investment). Another core idea is that despite the incumbent banks and FinTechs have different processes; the outputs are similar. Thereby, the document determines the inclusion and exclusion criteria for the FinTechs classification.

Consequently, Gromek (2018) stresses that these lack of standard in the classification of the FinTechs and the different definitions of these firms can have implications for robustness and become a source of misperception. Therefore, the author reinforces that if the mensuration of something not well defined can difficult this process.

As the first example of divergences in the categories, we can find some examples of different classifications (ROMANOVA & KUDINSKA, 2018). In their work, the authors use three different categorizations to talk about the FinTechs in the same

document: the first from Arner et al. (2015), that exemplify the five major areas of FinTechs; the second composed of a graph with a different classification from Statista Data (<http://www.statista.com>); and a third classification from the EY FinTech Adoption Index (2015).

The Hornuf; Haddad (2019) paper use some industry and institution reports (Ernst & Young 2016; He et al. 2017; World Economic Forum 2017) and categorize FinTechs into nine different categories. A compilation of categories is also used by Milian et al. (2019). The authors adopt a classification of the Activity Sectors of Fintechs based on (Khandwe, 2016) and CB Insights (2019). In the literature review, we found a relative relevance in the use of this classification given by CB Insights (2019) since the BACEN(2018a) and Milian et al. (2019) also categorize the FinTechs using such this classification.

A remarkable aspect in the categories is that each work can adapt the categories according to their research needs, such as technology, evolution, or consumer orientation.

Among the literature review about FinTechs in the Scopus, ISI – Web of Science and financial institutions documents, we found 13 documents with different categories. Figure 15 presents some examples of categories from the literature that we study in the present work and their explanations:

FIGURE 15 – EXAMPLES OF FINTECHS CATEGORIES

Category	Definition
Payments	The category payment entails business models that provide new and innovative payment solutions, such as mobile payment systems, e-wallets, billing, domestic transfers, and cryptocurrencies. (Gromek, 2018; Hornuf, L., & Haddad, C., 2018), allowing a new form of doing financial transactions easy and fast (ABFINTECHS, 2018).
Exchange	Companies that develop platforms and digital solutions to improve efficiency and relationship with customers for the exchange market and international remittances. ABFintechs (2018), international money transfer, and tracking software (CB INSIGHTS, 2019).
Lending and financing	Companies and digital platforms that enable loans and financing to individuals acquisition of goods, reduction of financial costs, personal credit, credit payroll, and working capital (ABFINTECHS, 2018). This category allows individuals, firms, and start-ups to use the Internet to acquire the necessary financing (GOMBER, 2017). Some examples include startups that provide crowdfunding, crowdlending, microcredit, and factoring solutions (HORNUF, L., & HADDAD, C., 2018)
Insurance	Companies that develop a platform and digital solutions to improve the level of service and offer diverse insurances. ABFintechs (2018) and provide data analytics and software for (re)insurers CB INSIGHTS (2019). This category broker peer-to-peer insurance, spot insurance, usage-driven insurance, insurance contract management, and brokerage services as well as claims and risk management services (HORNUF, L., & HADDAD, C., 2018).
Investment management	In the Gomber (2017) concept, (Digital) Investments support individuals or institutions in investment decisions and in arranging the required investment transactions on their own by use of the respective devices and technologies (GOMBER, 2017 p. 545). This category embraces execution operations as mobile trading, social trading, and online brokerage/trading (Gomber, 2017), savings accounts, equity crowdfunding (Gromek, 2018), and crowdfinancing (GIMPEL et al., 2017).
Advice	Companies that offer solutions focused on the offer and facilitation in decision making regarding investments (ABFintechs, 2018) and tools to manage bills and track personal and/or credit accounts (CBInsights, 2019), computer systems and programs that provide automated investment advice to customers or portfolio managers (CHEN, M. A., WU, Q., & YANG, B., 2019).
B2B	Services provided for other companies and not directly to the final customer. This category entails solutions involving capital markets, cybersecurity, data analytics, risk management, and Regtech, for example (CB Insights, 2019; Chen, M. A., Wu, Q., & Yang, B., 2019; Hornuf, L., & Haddad, C., 2018). It also entails companies leveraging blockchain and distributed ledger technologies for financial services (CB INSIGHTS, 2019; CHEN, M. A., WU, Q., & YANG, B. 2019).
Digital banks	PS related to the activities performed by traditional banks: account management; deposits;; mobile banks
Others	Some authors cite companies as in the FinTechs context, but not directly related to the previous examples. Examples of these companies include monetization, real state, and loyalty programs.

SOURCE: The Author (2020) based on the literature review

To adopt a standard categorization, we create a FinTechs Categorization Model of Analysis (FTCMA). We explain the methodology and the final framework of FTCMA in Appendix A. We create the FTCMA considering the need to compare the PS offered by incumbent, digital, and digitalized banks and FinTechs.

3 THEORETICAL STUDY FRAMEWORK

This section combines innovation and competitive advantage elements to choose one or more suitable competitive theories to analyze FinTechs and their consequences to the Brazilian financial industry. Also, we intend to discuss some aspects related to the relationship between incumbents and new companies, which are helpful in this understanding of FinTechs.

3.1 SELECTING COMPETITIVE ADVANTAGE AND INNOVATION THEORIES

This section seeks to combine innovation, competitive advantage, and FinTechs with exploring research possibilities. We combine these elements with the analyses developed in sections 2.2 and 2.3.

Figure 16 presents all the possibilities for combining conceptual approaches to innovation and competitive advantage. We do not intend to exclude other possible combinations by adopting partial elements from each of the three innovation clusters or the four competitive advantage theories. In another moment of analysis, with greater conceptual and empirical support, the FinTechs can be studied under a less objective conceptual framework.

FIGURE 16 –THEORETICAL STRUCTURES OF INNOVATION AND COMPETITIVE ADVANTAGE

Theoretical Structure	Innovation Cluster	Competitive Advantage Theory
TE1	Organising Innovation	Industrial Organization
TE2		Resources
TE3		Market Processes
TE4		Dynamic Capabilities
TE5	Economics of R&D	Industrial Organization
TE6		Resources
TE7		Market Processes
TE8		Dynamic Capabilities
TE9	Innovation Systems	Industrial Organization
TE10		Resources
TE11		Market Processes
TE12		Dynamic Capabilities

SOURCE: The Author (2020)

The initial construction of the relationships between the three innovation groups and the four competitive advantage groups described in sections 2.2 and 2.3 resulted in 12 possibilities for selecting theoretical views for FinTechs analysis. The objective of selecting these visions is not to exhaust the interaction of alternatives between innovation and competitive advantage theories to analyze the phenomenon in a single choice. Thus, we to choose a more appropriate set of theories, considering

the academic production available until 2019 that analyzes these companies. Next, we explain the specific criteria for choosing these theories (from now on clusters).

3.1.1 Selecting the Innovation Cluster

We will not use two innovation clusters presented by Fagerberg et al. (2012) in this study, despite their relevance. Next, we expose the reasons for their exclusion from FinTechs analysis according to innovation classifications.

Despite presenting aspects related to technology and innovation, the first cluster, Economics of R&D, is not adequate to explain the FinTechs phenomenon. This choice stems from the fact that this grouping centralizes its analyses on the economic impacts and the innovation relations with R&D. The incipiency of the FinTechs theme still does not allow the measurement of results for society. Thus, since this work aims to study FinTechs in the financial industry, the Economics of R&D cluster will not be considered.

The second cluster excluded, Innovation Systems, can not adequately explain the FinTechs phenomenon because it intends to analyze public policies and their concepts, such as the creation of National Innovation Systems (NIS). As analyze studies of innovation in countries, a later stage in the growth of companies such as FinTechs, Innovation Systems is a cluster impacted by factors that occur in the clusters of Organising Innovations and the Economics of R&D.

However, the vision of Innovation Systems presents concepts that, in the future, will allow analyzing the impacts of innovation on the financial industry, for example, based on the study of technological trajectories. Its analysis will define if the changes will occur at the level of these trajectories or change technological paradigms. This second alternative represents a change and substantially modifies the technologies used in this industry to solve problems.

When excluding these two innovation approaches, we do not intend to invalidate them. The exclusions only consider the current state of academic research on these companies and the degree of maturity of this new financial industry segment. These choices could be different if the research object were companies in industries at a more advanced stage of maturity, such as the traditional chemical industry, for example.

Among the three innovation clusters exposed by Fagerberg et al. (2012), the cluster of Organizing Innovation is considered the most appropriate for the study of

FinTechs. This choice arises from the fact that this cluster considers the analysis of the industry structure in the innovation process and the existence of the FinTechs argument as a new financial industry that applies the technology (SCHUEFFEL, 2016).

We also choose this cluster because it uses the following elements of analysis of the phenomena: innovation; organizations; sectors/industries; and firms. Other relationships relate to the fact that these companies operate in a market with low entry barriers (FSB, 2017) and are considered a way to correct imbalances in the financial market (BACEN, 2018).

The approach to the concept of disruptive innovations is also a decisive aspect of this choice. Although not all the authors frame FinTechs in this concept, we found a significant number of studies that use this classification, such as Christensen (2013), Chiu (2016), Dorfleitner et al. (2017), Gomber et al. (2018), Larsson et al. (2018), and Zalan; Toufaily (2017). Thus, the use of innovation clusters and competitive advantage theories can provide the necessary theoretical support to confirm or reject this concept based on the classification of disruptive innovations by Christensen (2013).

3.1.2 Selecting the Competitive Advantage Theories

In the analysis of the research possibilities of FinTechs according to the theories of Competitive Advantage, initially, two theories were excluded from the analysis. We exclude them considering they provide the theoretical basis on the internal functioning of companies. In the Resource Theory, this basis includes analyzing the stocks of resources and specific competencies of the companies, while the Dynamic Capabilities analyze the organizational processes and routines, resource flows, and specific competencies.

We choose the Industrial Organization theory of competitive advantage because it allows analyzing the industry in which these companies act. Despite the criticism regarding its static analysis (e.g., Nelson; Winter, 1982), the concepts of positioning, barriers to entry, and generic competitive strategies demonstrate research potential in the study of FinTechs.

A concept of this theory that, in the initial analysis, approaches the current state of FinTechs is that of strategic groups within the industry (PORTER, 1998). In this perspective, the author split the industry into groups formed by similar companies, which have akin market shares and respond in an analogous way to the same events. Thus, companies must choose which group to position themselves within the industry

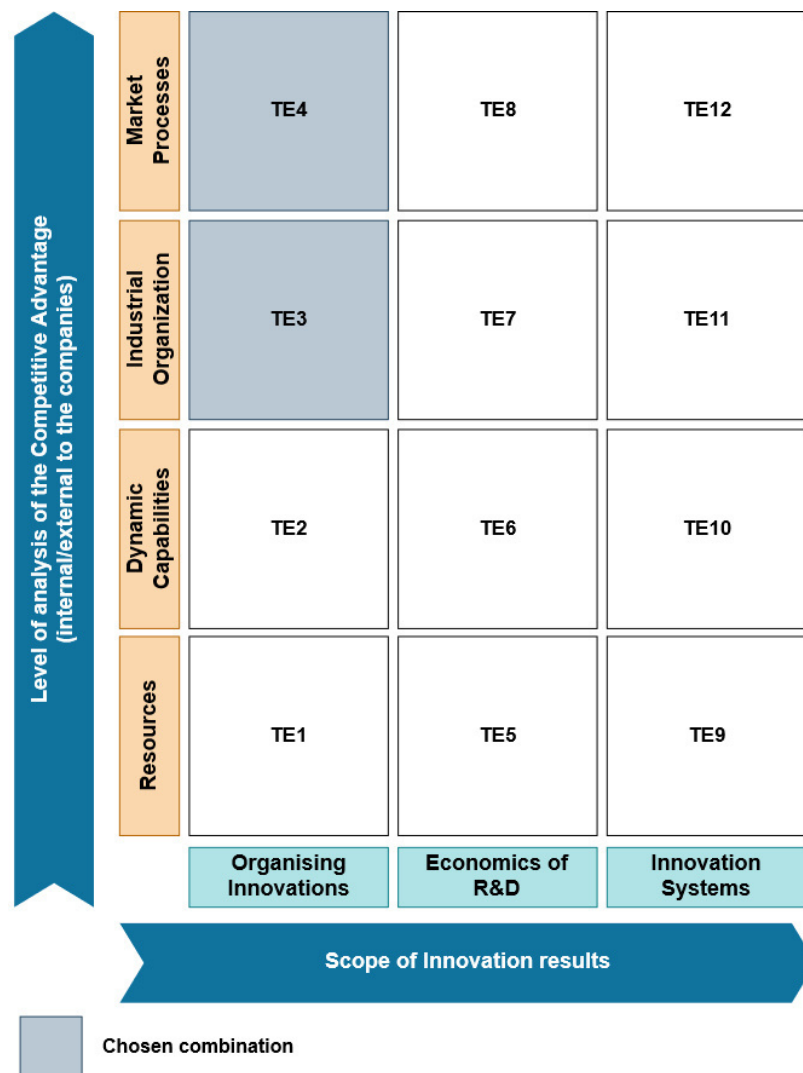
or move between them or form a new group. It allows to conjecture that FinTechs are a group in the financial segment or will evolve to create a new industry (SCHUEFFEL, 2016).

Alt et al. (2018) and FSB (2017) reinforces that the possibility for FinTechs constitute a new industry is due to the fact the existence of structural differences from incumbent banks, lower entry barriers, and low switching costs. New software and applications developed by these new companies require study, not only for the use of new technologies to offer traditional services but also for their competition and complementarity with the agents established in the financial system. Thus, FinTechs can also emerge from other industries, such as IT.

The choice of the second theory, Market Processes, is justified by the literature on FinTechs characterizing them as new companies (Puschmann, 2017), which are likely to correct imbalances in the financial system and threaten the traditional banks (BACEN, 2018). Also, we emphasize the possibility of generating entrepreneurial rents from the process of creative destruction, a concept developed by Schumpeter (1983).

To contribute to the development of the model to be presented, Figure 17 shows the possible combinations between Innovation and Competitive Advantage theories. The design highlights the combinations with the best capacity to explain the FinTechs phenomenon.

FIGURE 17 - THEORETICAL STRUCTURES BETWEEN INNOVATION AND COMPETITIVE ADVANTAGE

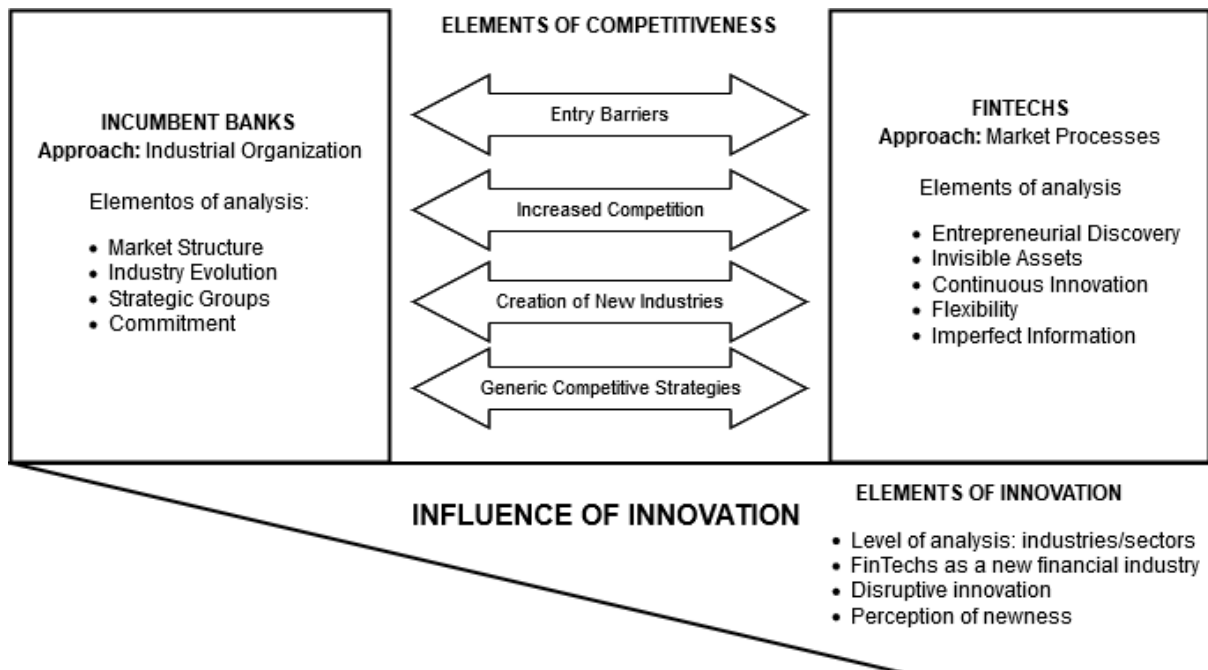


SOURCE: The Author (2020)

Figure 17 proposes analyzing the relationship between incumbent banks and FinTechs in a competitive environment. The evaluation structure considers the other theoretical clusters only in a complementary way, as explained earlier.

To provide a better understanding of the choices described in Figure 17, Figure 18 shows how the potential relationship between incumbent banks and FinTechs can occur, as well as the elements of competitiveness and the influence of innovation on this interaction.

FIGURE 18 – RELATIONSHIP BETWEEN INCUMBENT BANKS AND FINTECHS



SOURCE: The Author (2020)

3.1.3 Evaluation of potential theoretical conflict between the Industrial Organization and Market Processes theories

Despite the previous explanations about the choice of the theories of Industrial Organization and Market Processes as the most suitable in analyzing FinTechs, some theoretical conflicts may result from these choices. This section aims to explain this struggle based on theoretical discussions in the academic literature about this conflict.

In the beginning, it is essential to point out how these theories analyze the market equilibrium. The theory of industrial organization uses the price mechanism to define the market equilibrium. The theory of market processes, in turn, understands that discrepancies in market phenomena are common since differences in performance between companies are intrinsic situations (VASCONCELOS; CYRINO, 2000).

To compare theories and schools influenced by the fundamental theories, the concept of "Neoclassical School" is also used to refer to the influence that this plays in the Theory of industrial organization. Similarly, the term "Austrian School" is referred to as the concepts associated with the current Market Processes. Jacobson (2011) demonstrate the differences in perspectives between the theory of industrial organization and the Austrian school, according to Figure 19.

FIGURE 19 –PERSPECTIVES OF INDUSTRIAL ORGANIZATION AND AUSTRIAN SCHOOL

	Industrial Organization-Based Strategy	Austrian Economics-Based Strategy
Strategic Objective	Restricting competitive forces	Entrepreneurial Discovery
Market Conditions	Equilibrium	Disequilibrium
Profitability Modeling	Empirical regularities	Heterogeneity
Nature of Success Factors	Observed strategic factors	Unobservable factors

SOURCE: JACOBSON (1992, P. 785)

While the theory of industrial organization highlights the balance of markets and the generation of above-normal profits by restricting competitive forces, with elements such as barriers to entry (Porter, 2004), the Austrian school uses entrepreneurial discovery as a preponderant factor. Who makes this discovery is the entrepreneur, motivated by the desire for above-normal profits in an ever-changing market (imbalance). Thus, in the Austrian school, the success of firms is dependent on specific factors in time and unobservable variables (JACOBSON, 1992).

Despite criticisms about equilibrium treatment by neoclassical theory (static and without considering the dynamics of the real world) and the perspective of market processes (internally inconsistent), the present work does not focus on equilibrium analysis. Figure 20 shows the elements we will use as a basis for the analysis:

FIGURE 20 – ELEMENTS OF INDUSTRIAL ORGANIZATION AND MARKET PROCESSES

Theory	Elements	Condensed Concept	Main Authors
Industrial Organization	<ul style="list-style-type: none"> - Structure-Conduct-Performance - Extended Rivalry (five competitive forces) - Generic Competitive Strategies - Positioning - Sustainable Competitive Advantage - Commitment 	In a static analysis, the structure and barriers of the industry, the position of the company in its strategic group, the extended rivalry, and the investment in assets of difficult detachment determine the performance and the competitive advantage of the firms.	Mason (1939); Bain (Andreano; Warner, 1958); Porter (1985); (Porter, 1996); (Porter, 2004); (Ghemawat, 1986); (Shapiro, 1989)
Market Processes	<ul style="list-style-type: none"> - Processes and Dynamics of Markets - Disequilibrium to the entrepreneurial discovery - Imperfect information - Cumulative nature of the development process - Creative destruction - Invisible assets 	Market imbalances, creative destruction, and factors invisible to firms generate the competitive advantage. However, this advantage can not be sustained due to the dynamics of market processes.	Itami; Roehl (1991); Jacobson (1992); D'Aveni (1994); Schumpeter (1997)

SOURCE: The Author (2020) based on the literature review

From an epistemological perspective, the maintenance of the neoclassical theory without replacing it with subsequent ones seems to be sophisticated falsificationism (Chalmers, 1993; Damke et al., 2011). We do not invalidate the neoclassical theory because the Austrian school has not yet formulated models for empirical analysis. Therefore, the neoclassical theory is considered scientific within the

criterion of sophisticated falsificationism since no one presented a substitute theory that has passed through the same empirical tests it has undergone.

In this way, we seek to extend the discussion beyond the equilibrium aspects and include different central elements in the two theories for testing the propositions of the work. The choice of these two theories occurs because adopting a single theory to extract the elements of analysis can ignore useful tools from another perspective that help the understanding.

We also hope that this duality can be useful because, although FinTechs belong to the financial industry, this type of company also has elements of the information technology industry as a technological baseline (Alt et al., 2018; Puschmann, 2017; Schueffel, 2016).

We exemplify using the two theories in the same work to analyze the relationship between the financial and information technology industry through the concept of extended rivalry (PORTER, 2004). FinTechs have values not apparent, hard to identify, without the possibility of comparison with the incumbent banks, which allows an analysis according to the concept of invisible assets (ITAMI; ROEHL, 1991).

Even Porter himself, who has his roots in industrial organization theory, shows a transition in searching to include more dynamic concepts in his theory. This transition is demonstrated by De Man (1994), who exhibits the evolution in publications from the perspective of industrial organization to the Austrian school.

Porter (1981) incorporates concepts of industrial organization in his analyses and presents an evolution of equilibrium analysis for the insertion of dynamic elements in his work. The author criticizes the equilibrium analysis as the preference for monopoly and the alliance with competitors looking for a "quiet life" PORTER (1990). In this way, the author emphasizes that firms lose competitiveness to others from more dynamic environments.

Porter (1996) emphasized the importance of positioning in the concept of strategy, which means performing different activities than rivals or performing similar activities in different ways.

Although the theory of industrial organization is considered static and does not consider the evolution of firms, Porter (1985) e Porter (2004) contest this criticism. Using the concepts of life cycle, technological evolution in the analysis of industries, and aspects internal to the firms (e.g., value chain and components of the vision of resources), the author exposes dynamic components of analysis of this theory.

However, criticisms regarding static equilibrium analysis are not restricted to the Industrial Organization theory alone. Resource-Based View is also criticized for considering static balance analysis as one of its propositions. McWilliams; Smart, (1995, p. 311) highlights it when stating that *"the static analysis is strongly inserted in the RBV."*

De Man (1994) justifies that, although Porter (2004) and Porter (1998) present a vision more focused on the theory of industrial organization than Porter (1990), this does not mean that the analytical instruments developed in the first two works have lost their value. Figure 21 shows a summary of the elements cited by De Man (1994).

FIGURE 21 – PORTER'S WORK COMPARED BETWEEN 1980 AND 1990

<i>Element</i>	Porter 2004 (Original 1980) Competitive Strategy	Porter 1998 (Original 1985) Competitive Advantage	Porter (1990) The Competitive Advantage of Nations
Intellectual roots	Industrial Organization	Predominantly industrial organization	Austrian economics
Nature of rents	Monopoly	Monopoly	Schumpeterian
Rationality assumptions of managers	Rational	Rational	Rational
Fundamental unit of analysis	Firm/products	Business unit	National influence on firm innovativeness
Short-run capacity for strategic reorientation	High	High	Moderate/low
Role of industrial structure	Exogenous	Exogenous	Endogenous
Focal concern	Structural conditions and competitive positioning	Internal sources of competitive advantage	Asset accumulation/inimitability
Definition of innovation	Narrow	Narrow	Broad
Influence of environmental pressure on competitive advantage	Unfavorable	Unfavorable	Favorable

Source: De Man (1994, p. 438)

When analyzing the role of imperfect information and creative destruction in the generation of competitive advantage, elements of the Austrian school, De Man (1994) points out that Porter (1990) establishes relations between these two perspectives by using common elements in the evolution of his work. By comparing the theory of industrial organization with the Business Policy, Porter (1981) also demonstrates the possibility of expanding and reviewing the concepts of the theory of industrial organization as a new promise.

Young (1995) describes another possibility of a relationship between the two theories. The author proposes an adaptation of the Structure-Conduct-Performance model and states that the *"Austrian school can be complementary with other basic disciplines of the strategy, such as the industrial organization. Better than excluding,*

this allows the construction of a dialogue in the field of strategy" YOUNG (1995, p. 333).

McWilliams; Smart (1995) also state that it is not necessary to stick to just one theory because the vast majority of industrial environments are, for the most part, neither static nor revolutionary. For the authors, firms face evolutionary change environments and it is better to have a hybrid model (in the example given by the authors, the Structure-Conduct-Performance model with Resource-Based Vision) than having a new theory free of inappropriate assumptions.

In exploring the relationships between competitive activity, competitive performance, and cooperative mechanisms in a multi-level model at the level of firms and industries, Young et al. (1996) relate the neoclassical theory and the Austrian school in the same analysis. By stating that *"the Austrian economy and the neoclassical are not mutually exclusive,"* Rosen (2011, p. 139) also highlights the possibility of a relationship between these two theories.

The treatment of data is another criticism of industrial organization theory because, since statistical data of economic events are historical, they say what happened in historical cases and non-repeatable (JACOBSON, 1992). In proposing the creation of the theory of comparative advantage of competition, Hunt; Morgan (1995) also criticizes the theory of industrial organization for the excess of mathematical terms and lack of application of these concepts in the real world. Nevertheless, the Austrian school do not propose tests or empirical elements that analyze the validity of their theoretical assumptions.

However, one of the members of the industrial organization theory recognized the limitations in the use of data. For Mason (1939), the statistical treatment of price data may not capture all the necessary elements. The author emphasizes the need for the study of market structures and recommends using price analysis as an accessory to the study of these structures.

The equilibrium and perfect competition, some concept for the critics of the neoclassical school, was used as a starting point for other theories of competitive advantage. Thus, according to Jacobson (1992, p. 795), *"although the Austrians characterize this uncertainty as characterizing the real world, traditional economists see equilibrium models as a starting point."*

Still in this discussion, Hunt; Morgan (1995) use perfect competition to elaborate their new theory of competitiveness. They claim its use because of the

following characteristics: its principles are well developed and known; it serves as an ideal form of competition; students see it as socially beneficial; and it was even used by the "dissenting economists" of evolutionary economics as a starting point.

Besides considering the neoclassical theory as a starting point, Rosen (2011) states that this theory also considers the importance of changes. Therefore, neoclassical economists analyze the changes in a more manageable way in a process towards balance. The author also states that the Austrian school characterizes the market in a state of perpetual imbalance. For Rosen (2011, p. 150), *"the question is to define which lines of thought work best in practice, a question in which the neoclassical economy has its share of success."*

Regarding criticisms to the Austrian school, the lack of motivation to elaborate a framework of strategy development with perspectives, courses of action, and research topics was, according to Jacobson (1992), that this theory received little attention in the strategy literature.

The author also states that their equilibrium analysis does not have the degree of precision, integrity, or lack of ambiguity characterized by equilibrium models. Thus, *"the reluctance to use analytical tools or develop testable propositions is also seen as a deficiency in the Austrian approach"* (JACOBSON, 1992, p. 795). Nell (2010, p. 139) adds, *"the Austrian school does not offer a formal alternative model to the equilibrium models of neoclassical synthesis."*

Young (1995, p. 339) also criticizes the lack of proposition by the Austrian school, where *"the Austrian school of economics has a fascinating and rich history that encompasses a collection of themes rather than a specific theoretical doctrine."* Bradley (2010) also reinforces this criticism of the lack of empirically testable hypotheses by the Austrian school.

Gloria-Palermo; Palermo (2005) add the inconsistency between the normative and positive pillar of the Austrian school arguing that the free market defended by it will never be reached because it is in permanent change. The authors point out that the *"normative engagement of the Austrian school results from a mixture of strong ideological positions and weak theoretical elements and is ultimately unsustainable for scientific reasons."* (GLORIA-PALERMO; PALERMO, 2005, p. 77).

However, despite not presenting alternative formal models to those of the neoclassical school, the concepts of competitiveness of the Austrian school can not be

disregarded (Nell, 2010) because they provide useful elements on how markets work (BRADLEY, 2010).

We summarize these elements and concepts, as the strengths and weaknesses in the literature about these two theories in Figure 22:

FIGURE 22 - STRENGTHS AND WEAKNESSES IN THE LITERATURE OF COMPETITIVE ADVANTAGE

Works	Theory	Strong / Weak Points	Commentaries and criticisms
<i>Jacobson (1992); De Man (1994); Dickson (1992); Shapiro (1989)</i>	Industrial Organization	Weak	Takes a static view of competitiveness and ignores uncertainty and disequilibrium
<i>Jacobson (1992)</i>	Industrial Organization	Weak	Uses monopoly power as a competitive advantage
<i>Jacobson (1992)</i>	Industrial Organization	Weak	Exclusive use of visible factors for modeling phenomena (e.g., Econometrics)
<i>Nelson; Winter (1982)</i>	Industrial Organization	Weak	Minimizes the role of the dynamic environment provided by technological change
<i>Nelson; Winter (1982)</i>	Industrial Organization	Weak	The equilibrium analysis provided by Industrial Organization provides insufficient insight into the motivation and consequences of innovation
<i>Jacobson (1992)</i>	Industrial Organization	Weak	Insufficient motivation to search for new methods and products, as in the case of innovation
<i>Hunt; Morgan (1995); Porter (1981)</i>	Industrial Organization	Weak	Terms used derived from mathematical exercises fail to explain how the real world works
<i>McWilliams; Smart (1995); Hill; Deeds (1996)</i>	Industrial Organization	Weak	Use of static data (non-longitudinal) makes dynamic analysis impossible
<i>Hunt; Morgan (1995)</i>	Industrial Organization	Strong	Provides explanations of the potential for wealth production of market economies based on efficiency.
<i>Hunt (1995)</i>	Industrial Organization	Strong	The propositions of perfect competition are well developed and known
<i>Hunt (1995)</i>	Industrial Organization	Strong	The perfect competition is an ideal form of analysis against the other existing ones.
<i>Rosen (1997)</i>	Industrial Organization	Strong	Best practical application compared to the options of the Austrian School
<i>Jacobson (1992)</i>	Market Processes	Weak	Have not pointed out an alternative framework to the neoclassical equilibrium model
<i>Jacobson (1992)</i>	Market Processes	Weak	Reluctance to use analytical tools or to develop testable propositions
<i>Young (1995); Nell (2010)</i>	Market Processes	Weak	Should be transposed to a managerial perspective for the development of theories
<i>Young (1995); Hill; Deeds (1996); Nell (2010)</i>	Market Processes	Weak	Insufficient analytical rigor and a specific theoretical doctrine for the operationalization of the concepts
<i>Nell (2010); Gloria-Palermo; Palermo (2005)</i>	Market Processes	Weak	The hypothesis of search for equilibrium is internally inconsistent because the change will always exist in the model
<i>Gloria-Palermo; Palermo (2005)</i>	Market Processes	Weak	Focus on value judgements undermines normative prescriptions
<i>Jacobson (1992)</i>	Market Processes	Strong	Entrepreneurial discovery motivated by above-normal profits
<i>Jacobson (1992)</i>	Market Processes	Strong	Dynamic vision with continuous innovation and flexibility
<i>Jacobson (1992)</i>	Market Processes	Strong	Specific treatment considering the specificities of each situation, without generalization

SOURCE: The Author (2020) based on the literature review

To conclude this discussion, although the theory of industrial organization is considered excessively formal and does not faithfully reflect the real world, the subsequent models that criticize it fail to provide the formalism and empirical tests that

allow its complete replacement. Thus, the proposition of joint use of elements of the two theories in this essay seeks to unite concepts and constructs found in the markets in which FinTechs and the incumbent banks operate.

This work seeks to look initially at the financial industry from an external perspective: what theoretical framework is suitable to understand the industry in which the incumbent banks and FinTechs operate. This change of vision requires concepts from both schools. Therefore, the analysis of the industry, one of the central elements of the theory of industrial organization, can not be ignored in the face of subsequent theories.

3.2 RELATIONSHIP BETWEEN INNOVATION AND COMPETITIVE ADVANTAGE

Since the theoretical objective of this work is the relationship between theories of innovation and competitive advantage, this section presents the theoretical linkages found in the referenced bibliography of these two perspectives. Despite presenting these ideas, it does not intend to exhaust the discussions on concepts presented by these theories.

(Porter, 1985) emphasizes that although technological innovations have strategic implications for firms and influence industries as a whole, not all technological changes are strategically beneficial. The author attributes this to the dubious role of technology because if innovation increases the profits of firms and competitors imitate the innovation, it eliminates the competitive advantage created by the company.

Regarding new entrants, Porter (1990) clarifies that innovations in different industrial sectors can threaten the market power of big incumbent firms, mainly if these new companies are small. These new entrants can offer the same PS as the incumbent companies (Porter, 2004) or, according to the disruptive innovation theory, fewer PS but with different technologies than the big companies CHRISTENSEN (2013).

Using the market as a result of innovation, Porter (1990, p. 45) describes: *"companies create competitive advantage by perceiving or discovering new and better ways to compete in an industry and bring them to the market, which, ultimately, is an act of innovation."* In this context, the author says that the search for competitive advantage itself is an act of innovation, despite the classical concept of innovation does not consider this point.

Still, regarding competitiveness, Cantwell (2004) divides the analysis of competitiveness into three levels: countries, industries, and firms. For the author,

capacity building through different paths determines the winners through innovation. Besides, efforts to promote competitiveness through innovation can rarely be understood in isolation from other profitable factors for firms.

Simmie (2008, p. 19) also describes the role of innovation in a context of competitiveness as *"a crucial driving force behind productivity and competitiveness."* Thus, the author argues that productivity can not be developed in isolation because it is highly dependent on innovation.

According to Dagnino (2012), the analysis of innovation allows exploring themes such as technological change and timing of innovation, placed in perspectives of different units of analysis, such as firms, industries, and countries.

The literature that analyzes the relationship between innovation and competition also considers innovation as a driving force (Simmie, 2008), the timing as an essential component (Dagnino, 2012), and the market as a result of the innovation (PORTER, 1990).

3.3 IMPACTS AND DIFFERENCES BETWEEN FINTECHS AND INCUMBENT BANKS

Relationships between incumbents and new entrants are at the core of the innovation competition. Companies in such situations may, on the one hand, compete for market power and choose to establish their new or improved technologies. On the other hand, the incumbents may perceive the threats presented by new entrants and try to establish alliances or other types of cooperation.

According to the Schumpeterian tradition (Mark I and II), the size and characteristics of the companies can result in distinct results (BARRAS, 1990). In the entrepreneurial model (Mark I), individuals with inventions, ideas, assumptions about unmet needs, and risk investing can profit from radical innovations. These entrepreneurs achieve temporary monopoly profits of innovations under a flexible industry structure with low entry costs and encourage experimentation. The Corporate (oligopolistic) models (Mark II) pose the scale economies from technological progress as the competitive factor, which provides advantages for large companies.

Otherwise, this can result in diseconomies of scale, inertia resulting from organizational structures, and difficulties in changing strategies due to the commitment to past investments. Barras (1990) also cites the technological opportunity, market

conditions, and industry structure as the factors that can ensure the rapid take-up and the use of new technologies within a particular industry.

Rothaermel (2001) uses empirical data to analyze the interaction between the incumbents and the new entrants via interfirm cooperation and use the Schumpeterian creative destruction theory as their intellectual basis. The author uses the links among interfirm cooperation with new entrants to adapt to radical technological change and contribute to an overall improvement in industry performance. However, this cooperation depends on the ownership of complementary assets (exploitation) by commercializing the new technology (HILL; ROTHARMEL, 2003). As an example of the impact of new entrants, the authors cite the Swiss watchmaking industry, almost destroyed by the quartz, one of its inventions.

Hill; Rothaermel (2003) cites a great abyss created by a radical technological innovation that revolutionizes competition in their industry. Even though not all incumbent firms that do not change their behavior facing new and innovators entrants, the authors conclude that not all radical innovations cause the bankruptcy of incumbents. Incumbents face most risk during the radical innovations appearance and are slow to recognize the threats posed by these innovations. This inflexibility of incumbents contains three factors: economic (market power and monopoly rents); organization theory (role of inertia); and strategy (strategic commitments).

Henderson (1993) argues that incumbents invest more in incremental innovation and gain a larger market share as a historical market power function. Nevertheless, they are significantly less productive than entrants in their attempts to introduce radical innovations to avoid making their existing capabilities obsolete. Having significant strategic incentives to invest in radical innovation, new entrants will replace incumbent firms during radical technological change periods. Also, due to the low productivity of the research efforts of incumbents, the organizational theory suggests that established firms often fail in the face of radical innovation.

Abernathy; Utterback (1978) highlight that the identification of user needs is an entrepreneurial act. The authors highlight that new and small companies are adaptable and have the performance requirements to deal with the diversity and uncertainty inherent to new products. They also conceptualize major innovations as disruptive and external from the established industry (e.g., start-up, small firm), similar to what happens in the context of FinTechs, companies with similar properties to those located in the IT industry.

Alt, Beck, & Smits (2018) compare FinTechs and incumbent banks. Figure 23 shows three levels of transformation in order to demonstrate the main differences between these two categories of companies in terms of “external organization”, “organization of work networks”, and “internal organization”.

FIGURE 23 - COMPARISON OF FINTECHS IN THREE LEVELS OF TRANSFORMATION

Level of transformation	IT-using banks (until around 2008)	FinTech (after 2008)
External Organization		
- Regulation	low need for equity capital, low supervision	stricter rules, less protection
- Business model innovation	business in offline agencies and services	online and mobile services
- Infrastructure governance	centralized institution as a focal firm	distribution of tasks
- Payment style	most customers use cash	reduction of cash payments
Organization of working networks		
- Networking	a small number of partner networks	many specialist partners
- Costs: margins and structure	high margins in the core business	reduced margins and increased competitiveness
- Competitors	other traditional financial service providers	startups, side entrants
- Culture	hierarchical	cooperative, agile
- Customer retention	high consumer loyalty	low switching costs
Internal organization		
- Business focus	process-oriented	centralized in the consumer
- Interaction with consumers	initially offline	initially online, multiple channels
- Key competences	distribution, products, transactions	online distribution, platforms
- Vertical integration	high integration	low integration
- Service portfolio	banks as general service providers	small diversified suppliers
- Automation	processes require manual steps	fully automated processes
- IT architecture	monolithic systems, internal development	modular systems, APIs

SOURCE: ~ Alt et al. (2018, p. 238)

Regarding the advantages of FinTechs over incumbent banks, Wang et al. (2015) cite more frequent and transparent information flows and a credit analysis model similar to an auction, for example. The authors point out that banks do not have these activities or are at an early implementation stage.

The role of FinTechs as a threat to incumbent banks stems from the culture of the operational efficiency of these new companies (PHILIPPON, 2016). The author emphasizes that this usually occurs from the construction of computerized systems, which usually occur since the beginning of operations of FinTechs. For the author, this enables the maintenance of reduced operating costs and encourages/facilitates the emergence of new entrants.

Regarding the behavior of the banking industry with the emergence of FinTechs, FSB (2019) defines the relationship between the incumbent banks and FinTechs as complementary and cooperative. FinTechs do not have broad access to low-cost resources (as banks) and have small customer bases in more developed

market segments. Partnerships between these companies allow even small FinTechs to have access to low-cost resources and the already established clients of incumbent banks.

On the other hand, Nicoletti (2017) mentions the low-profit margin discussion.

“Even with a real possibility that a company may go bankrupt, if the initial growth rates are sufficiently high and if this growth rate contains enough volatility over time, then valuations can reach a level that would otherwise appear very high.” (NICOLETTI, 2017, p. 166).

The FSB also defines that competition with FinTechs can be a source of pressure on incumbent banks to adjust costs, impacting their profitability. Then, great banks can assume greater risks to maintain profit margins. As Anagnostopoulos (2018) says that bank movements present risks to the financial market, and their rigidity can facilitate the expansion of FinTechs.

However, despite the growing popularity of FinTechs, not all innovations brought by them differ from what the market previously offered. Then, some of these new companies only offer solutions already available in the market. In line with this, Miller (1986) argue

“many of the financial innovations on my earlier list already existed in one form or another for many years before they sprang into prominence. They were lying like seeds beneath the snow, waiting for some change in the environment to bring them to life.” Miller (1986, p. 460)

Gromek (2018) adds that, although the incumbent banks and FinTechs have different processes, the outputs are similar. The author states that FinTechs is a tool, not a destination. In a broader context, the financial market provides means to people to satisfy their financial needs, not delivering specific “ends” because the needs themselves are these “ends.”

Incumbent banks are often more immobile than FinTechs and can face the challenge of reinventing their business models, organizational structure, and work environment to deal with the changes in the financial industry (HORNUF; HADDAD, 2019). Otherwise, large financial institutions can initiate large-scale projects due to their “deep pockets,” which is not common in FinTechs. The authors add that FinTech solutions that only modify or digitalize old existing services can be easily copied by

incumbents. However, if these new companies focus on innovations and their unique selling point, it gets harder to copy.

It is essential to point out the scenario where the FinTechs arise. This context considers the performance of large banks in the acquisition of smaller institutions and financial intermediaries, which increases banking concentration, raises costs, and reduces the quality of banking services, especially for smaller clients.

Regarding the business model, FinTechs distinguish themselves by the fragmentation of the PS already offered by full-service banks, which can generate changes in the competitiveness of the financial market. Thus, prospects for the competitive impact of FinTechs depend primarily on the diversification structure of PS by the incumbent banks and the legislation of the countries in which these new companies operate.

Lee; Teo (2015) present the LASIC principle to define business models for FinTechs: low margin, asset-light, scalable, innovative, and compliance easy. They are worried about financial inclusion, but we bring for this thesis the discussion about low margin. FinTechs can be profitless because they have almost no physical infrastructure; they are under less regulation, and their market is broader than incumbent banks.

To summarize the discussion above, while incumbents rely on investing in radical innovations, the flexibility of new entrants allows their risky investments in radical innovations. However, these radical innovations do not guarantee that these new companies will cause the bankruptcy of incumbents.

Concerning the user needs, not only their identification by companies is essential. The provision of PS to meet these needs must also be responsive. Traditionally, large and incumbent companies do not present this flexibility due to their delay in recognizing these needs, diseconomies of scale, commitments with past investments, low productivity of research, and role of inertia.

Despite these favorable arguments to FinTechs, these new companies can not be considered undefeated or guaranteed success. Incumbent companies have deep pockets and can survive for long periods in technological instability environments, for example. Furthermore, these new companies can not be constrained just to digitalize old PS. If this happens, consumers may not perceive innovation and will be more reluctant to change their financial PS from incumbent companies to FinTechs.

4 METHODOLOGY

In this section, we present the methodology of the work. It is essential because *“methodology helps the scientific inquiry and includes research questions, worldview considerations, research designs, and data collection strategy”* (CHARLES TEDDLIE; TASHAKKORI, 2009, p. 27).

This chapter contains seven sections, starting with a discussion about theory, the mixed methods approach, and research paradigms. We add the validity requirements, constitutive definitions, research problems, and finalize with the research questions.

4.1 ABOUT THEORY

The building blocks of theory development are what, how, why, and who/where/when (WHETTEN, 1989). The choice of “what” is necessary to describe the factors (e.g., variables, constructs, concepts), also considering comprehensiveness and parsimony. “How” shows in what way the factors are related. “Who, where, and when” place limitations and scope. The “why” describes the dynamics of relationships and, sometimes, requires a review of “how” and “what” on the model.

The “why” is one of the foundations of propositions. Propositions *“involve concepts, should be well-grounded in the ‘whys’, as well as the ‘hows’ and the ‘whats’; if we use propositions, we need to limit them to specifying the logically deduced implications from research of a theoretical argument”* (WHETTEN, 1989, p. 492). The author also states relationships as the domain of the theory and that researchers need to extrapolate the boundaries of a specific theory.

Gregor (2006) defines theory as *“abstract entities that aim to describe, explain, and enhance understanding of the world and, in some cases, to provide predictions of what will happen in the future and to give a basis for intervention and action”* (GREGOR; 2006, p. 616). Besides, the theory requires boundaries to define the level of generalization using modal qualifiers (e.g., some, all, always, and never). Gregor (2006) describes a taxonomy with four contra goals: analysis; explanation; prediction; and prescription.

The author also lists four elements commons to all types of theory: means of representation (e.g., diagrams and tables); constructs; statements of relationships among constructs (e.g., associative, unidirectional, and conditional); and scope.

Causal explanations, hypotheses, and prescriptive statements are contingent components to include according to the purposes of the researcher (GREGOR, 2006).

Gregor (2006) also proposes **five theory types**, using the four contra goals (analysis, explanation, prediction, and prescription):

1. **Theory for analyzing** - “what is”: used when the phenomenon is not well known. Also described as schemas, frameworks, or taxonomies and related to the other four remaining types of theory because it contains their theoretical foundations.
2. **Theory for explaining** - “how and why”: seeks to understand the phenomenon without making predictions. Some examples are the structuration theory and the actor-network theory, commonly using case studies and ethnography as research methods.
3. **Theory for predicting** - “what will be”: in this type of theory, the explanation does not exist, generating a “black box”. This type of theory is common in econometric and financial studies, where researchers insert independent variables to increase the R^2 in using regression analysis.
4. **Theory for explaining and predicting** (EP theory) - “what is, how, why, when, and what will be”: include grand theories, as general systems theory. Use case studies, surveys, and experiments as part of their research methods.
5. **Theory for design and action** - “how to do something”: the author defines that this type of theory “*defines principles of form and function, methods, and theoretical knowledge*” (GREGOR; 2006, p. 628). As examples of work, the author includes software engineering research, prototyping, and design science.

Regarding the relationship between these five types of theories with specific paradigms, the author emphasizes that none of these theories have a clear and direct connection with some particular paradigm.

Besides, just inserting specific components (e.g., references, data, constructs, and diagrams) in research is also not considered a theoretical contribution, according to Sutton; Staw (1995). The explanation about the “why” relationships and phenomenon occur is crucial. The authors also add the possibilities of leeway when developing theory, given by empirical support.

DiMaggio (1995) contests the boundaries given by Sutton; Staw (1995) and argue that it exists more than one kind of good theory. Theories can present themselves as: covering laws (generalizations); enlightenment (requires references,

diagrams, or graphic presentations); narratives (social process); and, finally, a high number of hypotheses are necessary to explain variance. Then, a theory is a cooperative venture between the author and the readers (DIMAGGIO, 1995).

Bacharach (1989) specifies that the two purposes of theoretical statements are to organize (parsimoniously) and to communicate (clearly). The author delimitates that propositions are relationships of constructs and hypotheses are relationships between variables. The author states that constructs can not be observed directly (e.g., centralization, satisfaction, or culture). These elements are a *“broad mental observation of a given phenomenon”* (BACHARACH; 1989, p. 500).

About the other components, variables are *“observed units, which are operationalized empirically by measurement”* (Bacharach; 1989, p. 498) and propositions *“encompasses and relate abstract constructs to each other”* (BACHARACH; 1989, p. 500). Hypotheses are defined as *“the more concrete and operational statements of these broad relationships (between constructs) and are therefore built from specific variables”* (BACHARACH; 1989, p. 500).

Besides, Falsifiability *“determines whether a theory is constructed such that empirical refutation is possible”* (BACHARACH; 1989, p. 501). Utility *“refers to the usefulness of theoretical systems”* (BACHARACH; 1989, p. 500). That is, a theory is useful if it can both explain and predict. An *“explanation establishes the substantive meaning of constructs, variables, and their linkages, while a prediction tests that substantive meaning by comparing it to empirical evidence”* (BACHARACH; 1989, p. 500).

However, the author reinforces the need for prediction because *“prediction without explanation is a problem of incomplete theoretical systems”* (BACHARACH, 1989, p. 500).

4.2 THE MIXED METHODS RESEARCH APPROACH

We propose Mixed Methods as a research approach to this research and to achieve the conclusions.

Also known as the “third wave” or the third research movement, this approach mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts, viewpoints, or language into a single study in order to understand a research problem (Clark et al., 2008; Johnson; Onwuegbuzie, 2004). Johnson et al. (2007) describe a similar concept and emphasize that Mixed Methods

also offer more informative, complete, balanced, and useful results, defining the approach as a powerful third paradigm choice.

The method started in the early 1980s and was defined as a “quiet” revolution due to its capability to solve questions between the quantitative and qualitative approaches (CAMERON, 2009). Johnson et al. (2007) compare this methodology as a synthesis that developed and combine ideas from quantitative and qualitative paradigms. According to Denscombe (2008), this synthesis came about after the prevalence of two distinct paradigms: positivist paradigm (from the 1950s to mid-1970s), linked to quantitative studies; and constructivist (mid-1970s to 1990s), more related to the qualitative analysis. The integration of these two types of data has become increasingly common (Bryman, 2006) because each approach has its strengths/weaknesses, times, and places of need that kept us all check and balanced (Johnson et al., 2007).

Although quantitative and qualitative analysis can be appropriate to specific situations, the mixed analysis presents an advantage because it is a more workable solution from both approaches and produce a superior product (JOHNSON; ONWUEGBUZIE, 2004). Since it does not exist a perfect research method, the authors claim a contingency approach based on needs.

Charles Teddlie; Tashakkori (2009) emphasizes the possibility to simultaneously ask confirmatory and exploratory questions and generate theory in the same study as an advantage of the Mixed Methods. The authors state that this approach accomplishes two goals in the same study and can demonstrate the effects between variables and answer exploratory questions about how and why this relationship happens, being appropriate for doctoral dissertations. Figure 24 shows the dimensions of Mixed Methods positions, according to these authors.

FIGURE 24 – DIMENSIONS OF CONTRAST AMONG QUALITATIVE, MIXED, AND QUANTITATIVE METHODS POSITIONS

<i>Dimension of Contrast</i>	Qualitative Position	Mixed Methods Position	Quantitative Position
Methods	Qualitative methods	Mixed methods	Quantitative methods
Researchers	QUALs	Mixed methodologists	QUANs
Paradigms	Constructivism (and variants)	Pragmatism; transformative perspective	Postpositivism Positivism
Research questions	QUAL research questions	MM research questions (QUAN plus QUAL)	QUAN research questions; research hypotheses
Form of data	Typically narrative	Narrative plus numeric	Typically numeric
Purpose of research	(Often) exploratory plus confirmatory	Confirmatory plus exploratory	(Often) confirmatory plus exploratory
Role of theory; logic	Grounded theory; inductive logic	Both inductive and deductive logic; inductive-deductive research cycle	Rooted in conceptual framework or theory hypothetico-deductive model
Typical studies or designs	Ethnographic research designs and others (case study)	MM designs, such as parallel and sequential	Correlational; survey; experimental; quase-experimental
Sampling	Mostly purposive	Probability, purposive, and mixed	Most probability
Data analysis	Thematic strategies; categorical and contextualizing	Integration of thematic and statistical; data conversion	Statistical analyses; descriptive and inferential
Validity / trust worthiness issues	Trustworthiness; credibility; transferability	Inference quality; inference transferability	Internal validity; external validity

SOURCE: Charles Teddlie; Tashakkori (2009, p. 27)

Clark et al. (2008) emphasize that mixed methods provide the opportunity to look at the problem from more than one perspective because it incorporates a level of flexibility that facilitates an emergent design. Another strong point related by authors is the possibility to combine both numbers and text, which also helps bridge the gaps between research and practice. From a survey with 31 leading mixed methods research methodologists, Johnson et al. (2007) identify breadth, corroboration, and better understanding as the elements and justifications concerning the use of this method.

Thus, regarding the type of data, the present work will utilize both qualitative and quantitative data. This choice considers the Mixed Methods approach, the scarcity of information about digitalized/digital banks, and the difficulties in differentiating from QUAN and QUAL data, as described by Bryman (2006). The author claims that this distinction is occasionally problematic, such as when the qualitative data available for

Given the characteristics and elements from Figure 24 and Figure 25, we chose the exploratory design, described in the option (d) of Figure 25, to be used in the current research. The decisive factor in this choice is the possibility of initially exploring the relationship between the theories and the research objects qualitatively, which provides a ground basis to measure, generalize, or test these qualitative results in the quantitative stage.

We also choose the exploratory design due to some differences between research in financial and manufacturing innovation research. Financial innovation experiences a relative dearth of empirical studies related to quantitative analysis or hypothesis testing (Akhavain et al., 2005; Frame; White, 2004).

The financial industry does not have a tradition of R&D and patenting as the manufacturing sector. This scarcity of useful data does not allow research to the IO tradition of hypothesis testing and conducting empirical works, like those focused on the manufacturing sector (FRAME; WHITE, 2004).

The sources of financial innovation are an aspect poorly understood (LERNER, 2006). It occurs due to the shortage of research in this area and the low adoption of the patents by financial service firms (instead of the manufacturing sector). This last factor hinders the evaluation and the research about innovation in the financial sector.

To deal with that issue, the author justifies adopting alternative measures of innovation to analyze financial innovation. As an example of the use of these measures, Lerner (2006) compile articles in the Wall Street Journal between 1990 and 2002 related to new financial products, services, and institutions, using print and electronic indexes to identify stories related to this type of innovation.

Considering these differences in research about innovation, the present work aims to adopt some research strategies to deal with this scarcity and peculiarity in data compared with the manufacturing industry. However, we will establish procedures concerning data triangulation and analysis of the robustness of sources to ensure the validity of the results.

4.2.2 Examples of the use of Mixed Methods

The Mixed Methods are frequently employed in the study of competitive strategy, financial PS, and innovation, as illustrated by Figure 26.

FIGURE 26 – EXAMPLES OF STUDIES USING MIXED METHODS RESEARCH

Author	Title	Journal / Book	Year
Curado, C.; Muñoz-Pascal, L.; Galende, J.	Antecedents to innovation performance in SMEs: A mixed methods approach	Journal of Business Research	2018
Grimpe et al.	R&D, Marketing Innovation, and New Product Performance: A Mixed Methods Study	Journal of Product Innovation Management	2017
Hampshire, C.	A mixed methods empirical exploration of UK consumer perceptions of trust, risk and usefulness of mobile payments	International Journal of Bank Marketing	2017
Cortimiglia, M. N.; Ghezzi, A.; Frank, A. G.	Business model innovation and strategy making nexus: evidence from a cross-industry mixed-methods study	R&D Management	2016
Azorín et al.	The effects of quality and environmental management on competitive advantage: A mixed methods study in the hotel industry	Tourism Management	2015
Gerschewski, S.; Xiao, S.S.	Beyond financial indicators: An assessment of the measurement of performance for international new ventures	International Business Review	2015
Mullan, J.; Bradley, L.; Loane, S.	Bank adoption of mobile banking: stakeholder perspective	International Journal of Bank Marketing	2015
Kolleck, N.	Social network analysis in innovation research: using a mixed methods approach to analyze social innovations	European Journal of Futures Research	2013
Weber, O.	Environmental Credit Risk Management in Banks and Financial Service Institutions	Business Strategy and the Environment	2012
Molina-Azorín, J. F.	Mixed Methods Research in Strategic Management: Impact and Applications	Organizational Research Methods	2012
Molina-Azorín, J. F.	Mixed methods in strategy research: Applications and implications in the resource-based view	Book: Research methodology in strategy and management	2007

SOURCE: The Author (2020) based on the literature review

Then, the choice of Mixed Methods as a methodology in this work is justified because the subject is emerging and requires an academic treatment, which allows the exploratory study. The initial lack of knowledge about the variables of interest is one reason to adopt this methodology. Following Clark et al. (2008) recommendation, researchers may start their research projects collecting qualitative data about the inquiry topic. After analyzing this data, they can identify essential variables that will serve as a basis for collecting quantitative data in the second phase of the study.

In addition to the factors mentioned above to use this methodology, other authors cite different justifications for its utilization. These reasons include the need to improve data accuracy, the complementarity of data, avoiding biases intrinsic to single-method approaches, greater validity, completeness, and a way of developing the analysis and building on initial findings (BRYMAN, 2006; DENSCOMBE, 2008).

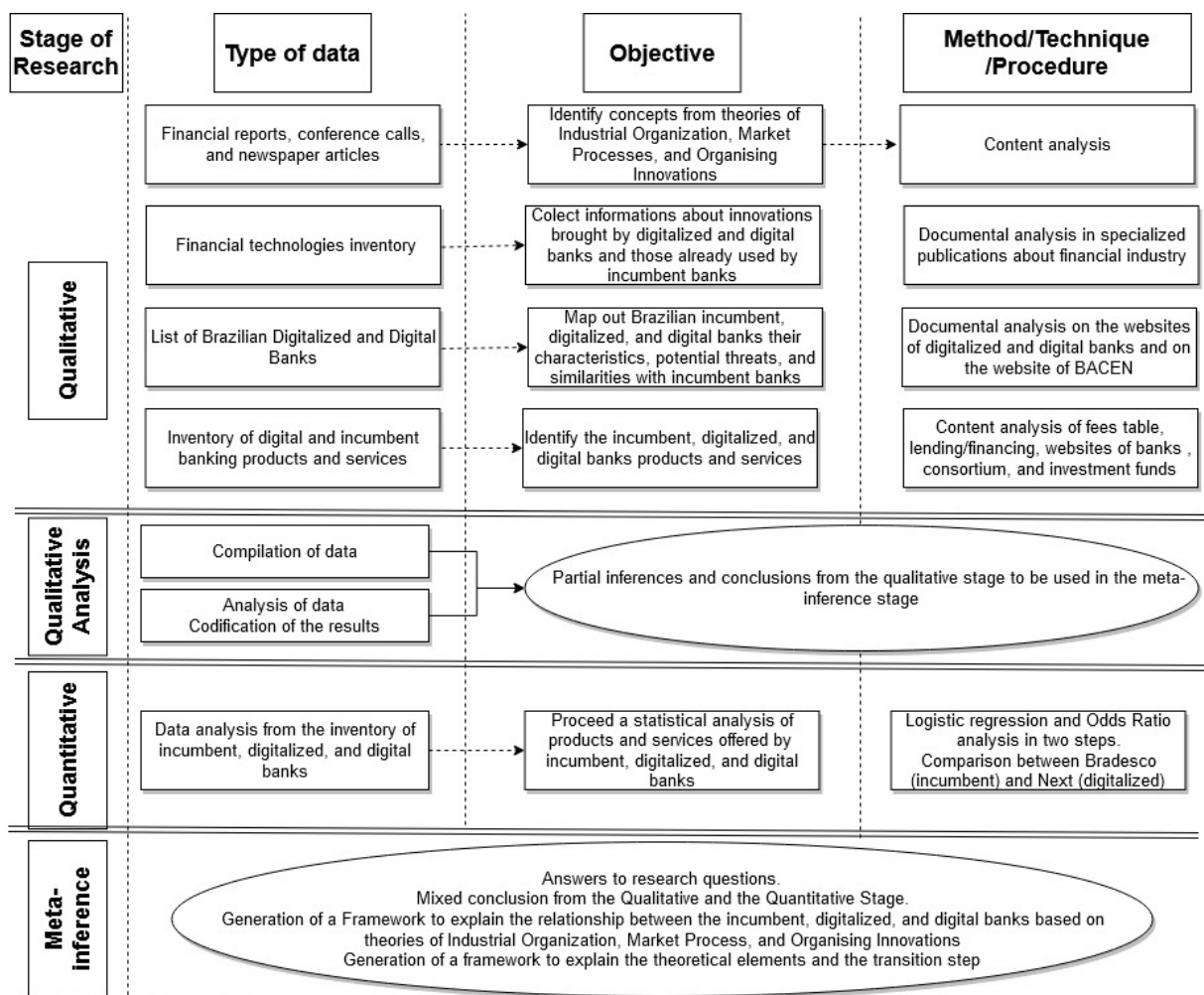
We use the stages suggested by Clark et al. (2008), as listed below and complemented in the Research Design Overall Model in the next section.

- ✓ Identify a research problem.
- ✓ Evaluate initial considerations
- ✓ State at least one quantitative and one qualitative research question
- ✓ Identify the types of quantitative and qualitative data that will be collected
- ✓ Identify the reason or objective for collecting both types of data
- ✓ Determine how the data will be analyzed
- ✓ Choose a mixed methods design type
- ✓ Specify the timing, weighting, and mixing
- ✓ Write a mixed methods research question
- ✓ Draw a visual diagram of the procedures

4.2.3 Research Design Overall Model

Figure 27 illustrates the general research design layout of the present work.

FIGURE 27 – RESEARCH DESIGN



SOURCE: The Author (2020)

4.3 RESEARCH PARADIGMS

The discussion about if the QUAL or QUAN approach is the most suitable to research is not the only one concerning the Mixed Methods research. The paradigms issue and their correspondent worldviews are another questions that we need to consider when choosing the Mixed approach as the research design. This section will discuss the choice of pragmatism as the approach to the present work.

We chose the mixed-method considering the research possibilities, theories, and characteristics of the object. The Mixed Methods is the best option for the present work because it provides an opportunity to conduct the research in an exploratory way, without rejecting the possibility of confirming the qualitative findings in the quantitative stage and at the meta-inference step.

The pragmatism is a consequence of mixed methods because this philosophical approach is the suitable option available in the literature when working with this category of methods. Denscombe (2008) defines pragmatism as the philosophical partner for the Mixed Methods approach because it provides a fusion of approaches.

Pragmatism is a method for settling metaphysical disputes, offers a middle position philosophically and methodologically, and a paradigmatic ecumenicalism between positivism and constructivism (JOHNSON; ONWUEGBUZIE, 2004). The authors emphasize that since the pragmatic method is outcome-oriented, it offers methodological mixes that can help researchers answer their research questions. Moreover, how the digitalization of banks is an emergent phenomenon, the pragmatic worldview can be used to answer questions about academic theories in a more practical way.

When choosing the pragmatic method, we also reinforce a worldview based on permeability across paradigms (Morgan, 2007) and the compatibility thesis (HOWE, 1988). The permeability is a response of the incommensurability of paradigms, a concept associated with the impossibility to create a one-to-one correspondence between the ideas in two correspondent paradigms. Similarly, the compatibility thesis denies that the wedding of QUAN and QUAL methods is epistemologically incoherent.

Then, as cited by Charles Teddlie; Tashakkori (2009), we do not believe that QUAL and QUAN paradigms are in opposing poles. Conversely, epistemological approaches act on a continuum and can exist in smaller or larger proportions in different points of the research. This pragmatic approach allows the possibility of work

with both types of data because sometimes, even the distinction between them is problematic (BRYMAN, 2006).

Concluding, we agree with Howe (1988) about the idea that knowledge is contingent. For pragmatists, truth is a normative concept because the truth is “what works”. This statement suggests that knowledge can not be completely abstracted from contingent beliefs, interests, and projects, mainly in social applied sciences.

4.4 VALIDITY REQUIREMENTS

Concerning internal and external validity requirements, the present work uses the Creswell; Clark (2018) list of three threats to validity to minimize these threats and ensure the robustness of procedures and results. Figure 28 demonstrates the first of these threats.

FIGURE 28 – FIRST VALIDITY THREAT

<i>Validity threat</i>	<i>The recommended strategy to minimize the threat</i>
Not building the quantitative feature based on the qualitative results	Make explicit how we use each qualitative finding to inform the development of specific elements of the quantitative feature

SOURCE: Creswell; Clark (2018)

To minimize this first threat, we use the content analysis to unfold and explicit the qualitative stage findings. The content analysis enables categorizing findings and their breakdown into several components, seeking to combine the qualitative components with the theories of competitive advantage and innovation.

The second validity threat is related to the need to perform rigorous research. In order to adopt this type of research, we adopt the recommendation in Figure 29.

FIGURE 29 – SECOND VALIDITY THREAT

<i>Validity threat</i>	<i>The recommended strategy to minimize the threat</i>
Not developing rigorous quantitative features	Use systematic procedures to design the quantitative feature

SOURCE: Creswell; Clark (2018)

We can not use the same data in the qualitative and quantitative stages of research. However, we relate them as described in each specific section. We describe the procedures adopted in this step to avoid errors in the selection in Figure 30.

FIGURE 30 – THIRD VALIDITY THREAT

Validity threat	The recommended strategy to minimize the threat
Selecting participants for the quantitative test that are the same individuals as the qualitative sample	Use a large sample of individuals for the quantitative sample who are different from those in the qualitative sample

SOURCE: Creswell; Clark (2018)

4.5 CONSTITUTIVE DEFINITIONS

For establishing a better level of detail about the research components, the present section exhibits two constructs and their constitutive definitions.

Constitutive definitions express concepts, synonyms, or words using other words (COOPER; SCHINDLER, 2014; KERLINGER, 1980). Despite being sometimes regarded as synonyms of concepts in the scientific community, constructs can be general terms expressing core ideas behind particularly related objects (KERLINGER, 1980). The author interprets that when we can attribute numbers to objects following specific rules, we also determine the variable as a construct. To avoid such misunderstandings, in this work, we establish two constructs: competitiveness and innovation.

Next, we define the two constructs, as well as their constitutive definitions.

a) Competitiveness

Constitutive definition: This means the existence of performance indicators that, when compared with similar companies in the financial industry, sign superior achievement. Superior performance results in the strategy adopted by companies (Vasconcelos; Cyrino, 2000) to create valor for buyers (Porter, 1998), generating exclusive benefits for firms (BARNEY, 1991). Considering the theories of industrial organization and market process, we consider that the competitive advantage of firms is a result of: structure and barriers of the industry; the position of the company; the extended rivalry; investments in assets of difficult detachment; market imbalances; creative destruction, and: factors invisible to firms.

b) Innovation

Constitutive definition: in the concept of innovation as a commercial or industrial application of something new Schumpeter (1983), we highlight the role of process innovations concerning banking PS. Therefore, most of the time, innovation in FinTechs is not only about new products or services, but about classic PS offered in

different ways and using new technologies. In this sense, the present work uses financial innovation closer to a synonym of new financial technologies. For example, although P2P is a new technology, it solves the need for credit, an old and classic banking product. At that point, innovation is a subtle line between old and new products, services, and technologies. To solve this boundary problem, we propose to call FinTechs as companies that only define themselves as such and those companies using new technologies to offer financial products or offer new products using new processes.

4.6 RESEARCH PROBLEM

The present work deals with two theories and a type of research object (banks), so it is suitable to establish a research problem that includes these elements. This problem must provide a framework to serve as a guide to analyze the competitiveness between the incumbent, digitalized, and digital banks using the innovation and competitive advantage theories. This section aims to evaluate initial considerations about this research and identify the research problem.

Since the digitalization of banks is an emergent topic in the financial industry studies, their competitive impact over the structure of this industry requires the use of established theories of competitive advantage. In section 3.1, Industrial Organization and Market Process have been chosen as the most suitable theories considering the most critical characteristics in the state of the art of academic research about the subject. Similarly, we choose the theory Organising Innovations as the most appropriate background among the innovation theories to analyze this same subject.

Based on the literature about financial innovation (Section 2.3), available studies lack academic explanations about the potential competitive impacts of new financial institutions. We can consider that academic research on this subject is at the exploratory stage, seeking forms of conceptualization, categorization, and understanding of the technologies used by these companies. Therefore, taking into account the issues raised in the course of the work, the underlying research problem of the present work is:

How to build a framework to analyze the competitive impacts of new innovation-based companies over incumbent banks in the financial industry? In other words, what are the main factors that influence the substitution of banking PS already existing by those offered by digitalized and digital banks?

4.7 RESEARCH QUESTIONS

In the Mixed Methods methodology, the researcher can pose separate or integrated questions concerning research topics. The initial question can be mixed, followed by quantitative and qualitative subquestions (TASHAKKORI; CRESWELL; 2007).

We start with an explicit mixed methods question, followed by the qualitative and quantitative questions. The qualitative questions seek for identify concepts of innovation and competitive advantage from newspaper articles. In the second stage, we will analyze the PS offered by three types of banks: incumbent, digitalized, and digital.

4.7.1 Mixed Question

How to build a framework to analyze the competitive impacts of new innovation-based companies over incumbent banks in the financial industry? In other words, what are the main factors that influence the substitution of banking PS already existing by those offered by digitalized and digital banks?

4.7.2 Qualitative questions

1. How to identify if digitalized and digital banks represent innovations in comparison with incumbent banks?
2. What elements and concepts from innovation and competitive advantage theories exist in the relationship among incumbent, digitalized, and digital banks?
3. What characteristics of incumbent banks present innovative and competitive advantages or disadvantages concerning digitalized and digital banks?
4. What are the competitive and innovative reactions of incumbent banks after the emergence of digitalized and digital banks?

4.7.3 Quantitative questions:

1. Is there a statistical difference among the availability of PS offered by the incumbent, digitalized, and digital banks?
2. Are there differences among the fees charged by the incumbent, digitalized, and digital banks?

3. Is there a statistical difference between the fees charged for PS concerning the type of technology by the three types of banks?
4. What are the differences in the technology adopted in PS offered by the incumbent, digitalized, and digital banks?

We will also identify if there are differences between the availability of PS and the fees charged by the banks Bradesco (incumbent) and Next (digitalized).

5 QUALITATIVE ANALYSIS⁵

The qualitative analysis is the first analysis of Mixed Methods. In this analysis, we look to answer the four research questions involving aspects of the three types of banks: competitiveness; innovation; and financial innovation.

At this stage, we analyze documents from financial reports and conference calls from the five biggest incumbent banks of the year 2019 and articles from the Brazilian newspaper Valor.

We will explain how we collect, pre-analyze, code, and select the qualitative information. Based on the literature, we also describe and justify choosing the methods to carry out this research stage. The qualitative analysis will also be part of the metainference and the conclusions of the present work.

When talking about FinTechs, most speakers cite other types of companies, such as asset management platforms, PI, and credit card acquirers. They do not differentiate them strongly, mostly before the year 2019. Some interviews represent digital banks as banks without brick and mortar branches (e.g., “*O IPO será o primeiro teste no mercado de capitais brasileiro de uma*” (21:5) and “*...Os lançamentos de bancos 'sem agência nem fila' não param.*” (23:2)⁶). According to our methodology of categorization in Figure 8, we tried as many as possible to understand and differentiate these situations in the qualitative analysis

5.1 CONTENT ANALYSIS

We analyze the documents from the financial reports and newspaper articles using the content analysis. Content analysis is a method that allows counting the frequency of words, phrases, or concepts (Miles et al., 2014) to draw conclusions regarding the research questions of interest (BHATTACHERJEE (2012). The author considers that it is an appropriate method when there are many texts to analyze, such as from newspaper stories, financial reports, and blog posting.

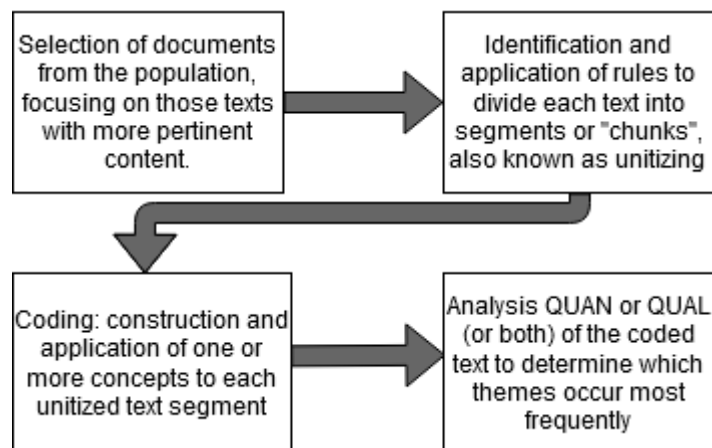
The content analysis process generates codes to assign meaning to the information compiled and categorize similar data chunks, also considered a discovery method (MILES et al., 2014). This possibility of discovery is essential due to the

⁵ The Atlas.ti project we analyze is available for download at <https://drive.google.com/file/d/1gkGa-KasloSVQFgArzIGGfQnuy20DiEB/view?usp=sharing>

⁶ From this point we identify the number of each document and the segment of text from Atlas.ti in the format (N^o of document: n^o of the segment).

exploratory nature chosen to the initial steps of the present research. Figure 31 shows the four essential steps of the content analysis, based on Bhattacharjee (2012).

FIGURE 31 – FOUR STAGES OF CONTENT ANALYSIS



SOURCE: Adapted from Bhattacharjee (2012, p. 115–116)

The task of select and analyze texts from several sources requires a theoretical basis to define the scope, collect, order, refine, and explore the results derived from this stage. To accomplish these tasks, we use the content analysis theory from Bardin (2002) and the coding technics from Saldaña (2013). It is noteworthy to point out we use only statements of the representatives, not the values of the reports.

Instead of just codifying and counting codes, we seek to analyze the meaning of the essential texts excerpts according to the theory, research questions, and hypotheses. According to Bardin (2002, p. 135), *"the content analysis can be carried out since the meanings that the messages provide."*

5.2 CHOICE OF DOCUMENTS

Lerner (2006) argues that there is a scarcity of data about financial innovations, such as R&D spending and patenting. The author states that alternative measures are needed and they use newspaper articles related to new financial products, services, and institutions, using print and electronic indexes to identify stories.

Van Der Boor et al. (2014) applied a similar strategy in using primary and secondary sources for their research, including company reports, news articles, case studies, documents by vendors, and interviews with experts and researchers. In addition to the justifications for using such data, Oliveira; Von Hippel (2011) analyze corporate websites of the five largest U.S. commercial banks as measured by assets as sources of financial services.

We decided to use secondary information due to the difficulties in interviewing representatives of large financial institutions, as described by Ruediger Kaufmann et al. (2012). Much information is available on financial reports and conference calls from banks, interviews, and articles in the Valor newspaper.

Financial reports are reliable because they also contain statements of these organizations. These statements express the analysis of representatives on past, present, and future actions about the market, competitiveness, and other subjects related to these organizations. The teleconferences, held after the disclosure of the financial reports, serve as additional explanations on these demonstrations, containing questions from the leading investors and stakeholders of banks.

Newspapers are also a rich source of data about financial markets (BHATTACHERJEE, 2012; LERNER, 2006). Brazil has several newspapers with national distribution and general daily content (e.g., Folha de S.Paulo and Estadão). However, we decided to avoid such sources because they are generalists and do not deal exclusively with economic and financial subjects.

We choose the Valor Econômico newspaper and financial reporters as the sources of qualitative data in this research. Its newspaper (founded in May 2000) has an average of 107 thousand daily readers⁷ and it is a Brazilian newspaper with prevalence in economic and financial markets, with a broadest national distribution. Valor Econômico has daily sections on finance, organizations, Brazil and politics, and legislation/taxes. The newspaper also publishes weekly/monthly newsletters and magazines about technology, innovation, *Micro, Pequenas e Médias Empresas* (MPMEs), logistics, 1,000 Brazilian companies, and the regional economy of Brazilian states.

Despite several Brazilian financial market analysis websites, we avoid using them because many (or almost all) are owned or strongly sponsored by stockbrokers (e.g., Infomoney). Using these websites could create more significant research bias than the use of the sources we choose.

⁷ Source: <https://valor.globo.com/brasil/noticia/2020/05/04/valor-vinte-anos-de-desafios-e-conquistas.ghtml>

5.3 STEPS OF QUALITATIVE ANALYSIS

In the **first step**, we choose the keywords related to our research. Instead of using the own search tool in the newspaper website, we choose the Google advanced search engine to improve the results. As keywords, we insert the names and abbreviations of the five biggest Brazilian banks in the search field “exact phrase” (bradesco OR santander OR caixa OR cef OR itaú OR banco do brasil OR BB). In the search field “any of these words”, we include terms related to FinTechs and digital banks in Portuguese (fintech, FinTechs, “banco digital” “bancos digitais”). Lastly, at the search field site or domain, we include the newspaper domain (<https://valor.globo.com>).

We do not include any observation in the remaining fields. The resulting weblink to this search is https://www.google.com/search?q=&as_epq=bradesco+OR+santander+OR+caixa+OR+cef+OR+ita%C3%BA+OR+banco+do+brasil+OR+BB&as_oq=fintech+fintechs+%22bancos+digitais%22+%22banco+digital%22&as_eq=&as_nlo=&as_nhi=&lr=&cr=&as_qdr=all&as_sitesearch=https%3A%2F%2Fvalor.globo.com%2F&as_occt=any&safe=images&as_filetype=&tbs=. Figure 32 shows the screen cutting with the search parameters mentioned above

FIGURE 32 – NEWSPAPER SEARCH IN 06/30/2020 AT BRAZILIAN 06:45 A.M.

Google

Pesquisa avançada

Localizar páginas com...

todas estas palavras:

esta expressão ou frase exata:

qualquer uma destas palavras:

nenhuma destas palavras:

números que variam de: a

Em seguida, limite seus resultados por...

idioma:

região:

última atualização:

site ou domínio:

termos que aparecem:

SafeSearch:

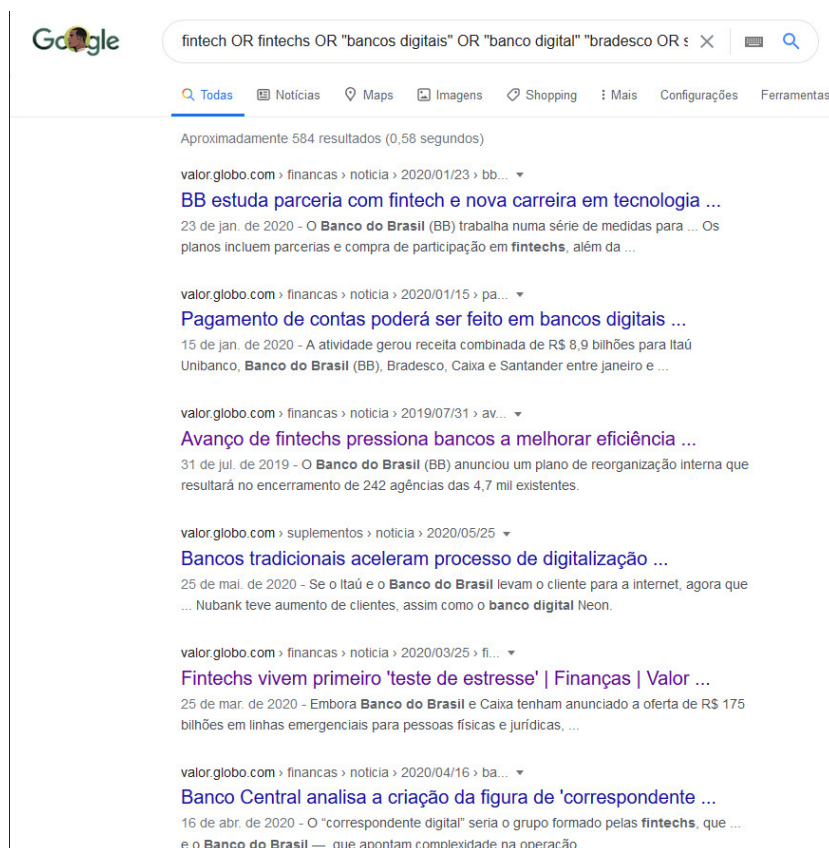
tipo de arquivo:

direitos de uso:

SOURCE: The Author (2020)

Figure 33 demonstrates the first search screen with the 584 newspaper articles resulting from the search carried out according to Figure 32.

FIGURE 33 – FIRST SEARCH SCREEN OF THE NEWSPAPER WITH 584 RESULTS



SOURCE: The Author (2020)

In the **second step**, we did a floating reading of the 584 articles. We look for documents related to the following subjects: banks, opinions of representatives of banks, competition, competitiveness, and innovation (bancos, opiniões de representantes de bancos, competitividade, concorrência, competição, and inovação). We exclude the articles that do not contain these words or related terms to them. The final result is a set of 133 articles collected from the Valor Econômico newspaper.

Also, we access the investor relations websites of the five biggest banks and choose the financial reports and conference calls with more information as possible. In these websites, we choose ten documents, including financial reports and conference calls. At the end of the second step, we 143 select documents to analyze.

In the **third step**, we export these 143 documents to the software Atlas.ti 8 Windows, developed by ATLAS.ti Scientific Software Development GmbH. Atlas.ti is a software that allows users to organize, code, manage, and select large bodies of text, graphical, audio, video data to be consequently analyzed.

In the **fourth step** we build a dataset with 71 previous codes according to the literature review and the essential aspects from the documents. We split these 71 codes into 13 **categories of analysis** encompassing seven categories encompassing unit of data (Innovation, Financial Innovation, General Innovation, Industrial Organization, Market Processes, Resources and Tools, and Statistics) and five categories units of context (action, banks, context, source, and speaker). Units of data represent words, objects, or events. In contrast, context units are useful to codify the unit of data and correspond to the message segments that explain their exact meaning (BARDIN, 2002). The unit of data categories are also known as *theory-driven codes* (SALDAÑA, 2013).

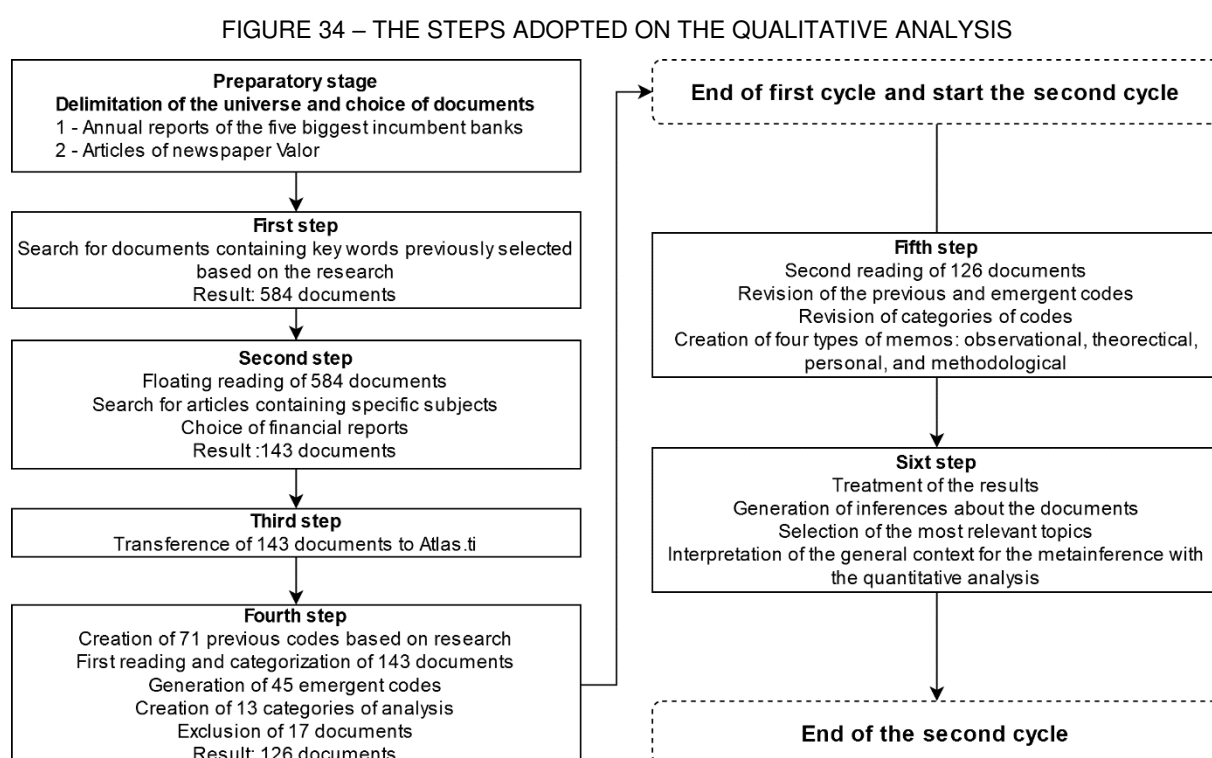
In this **step**, we categorize the 143 documents from the **third step** using the 71 previous codes described in the last step. This **step** generates **45** emergent codes. Emergent codes are also known as *data-driven codes* (SALDAÑA, 2013). They emerge because it is hard to map all of the codes before reading the documents. Then, the final dataset of codes contains 116 codes. At this step, we also exclude 18 documents (16 newspaper articles and two annual reports) without adherence to the context of the research or the words described in the **second step**. Then, the final list of readings is composed of 126 documents.

After this stage, we finish the **first cycle** based on the following coding methods: magnitude, descriptive, and sub coding (SALDAÑA, 2013). During the **first cycle**, the readings are most objective, looking out for sentences aligned to codes to start the codification. In the **second cycle**, the readings are more reflective, including codes generated after the first cycle readings and organized between these two steps and the creation of memos. These memos and their inferences about the documents are part of the theoretical coding (SALDAÑA, 2013).

It is hard for a researcher to define where the **first cycle** finishes and where the **second cycle** starts. It happens because the whole qualitative research adopted in this work is cyclical, and, sometimes, we need to include/exclude codes or groups of codes. We also tried to refine and improve the quality of research during the whole time. For example, some documents considered very easy to read in the **first cycle** take a longer time in the **second cycle**. It happens because the content has some nuances, and the analysis requires more comprehension of the document as a whole in the research context.

We start the **fifth step** by reviewing the codes and their categories to start the **second cycle** of analysis. In this step, we reread the 126 documents to improve the codification process, create memos, generate insights, create notes, and search for relationships between the documents and the theory.

In the **sixth and last** qualitative step, we carry out the treatment of the results, create inferences on the most relevant topics, and interpret the general context for later meta-inference with the quantitative analysis. Figure 34 demonstrates the qualitative analysis process.



SOURCE: The Author (2020) based on Bardin (2002) and Saldaña (2013).

5.4 ANALYSIS OF DOCUMENTS

In this section, we show the result of the analysis carried out according to Figure 34, split into two groups of documents: the financial reports/conference calls; and the newspaper articles from Valor. The analysis will take into account the most cited codes and the connections between such codes. We include the list of documents in Appendix C. In the complete coding process we generated 116 codes, which we use to classify into 832 citations. We show all the codes, their magnitude, group, and type. Table 2 demonstrates the 20 most cited codes, including their amount, category of analysis, and type of code (unit or context).

TABLE 2 – 20 CODES MOST CITED

Code name	Amount	Category of analysis *
<i>Rep of incumbent banks</i>	202	Speaker - Con
<i>Digitalization of older banks</i>	173	Action - Con Emergent codes - Con
<i>Analysis</i>	169	Context - Con
<i>Future outlook</i>	135	Context - Con
<i>Positive</i>	134	Reaction - Con
<i>Partnerships</i>	124	Industrial Organization - Data Emergent codes - Con
<i>Financial market analysts</i>	120	Speaker - Con
<i>New PS</i>	119	Emergent codes - Con Financial Innovation - Data
<i>Valor newspaper</i>	117	Source - Con Emergent codes - Con
<i>Digital statistics</i>	114	Statistics - Data
<i>User needs</i>	113	General Innovation - Data
<i>Incumbent actions</i>	103	Action - Con Emergent codes - Con
<i>Banco do Brasil</i>	98	Emergent codes - Con Banks - Con
<i>Bradesco</i>	95	Emergent codes - Con Banks - Con
<i>Digital banks</i>	93	Emergent codes - Con Banks - Con
<i>FinTechs</i>	88	Emergent codes - Con Financial Innovation - Data Banks - Con
<i>New entrants</i>	87	Industrial Organization - Data Emergent codes - Con
<i>Newspaper reporter</i>	72	Speaker - Con Emergent codes - Con
<i>Technological opportunity</i>	69	Financial Innovation - Data
<i>Open banking</i>	67	Emergent codes - Con Financial Innovation - Data
Total	2.292	

*Data = Unit of data;
Con = Code of context;

SOURCE: The Author (2020)

Regarding each incumbent bank, we extract 307 citations, including about BB (98), Bradesco (95), Itaú (59), Santander (40), and Caixa (15). From this total, 202 were statements from the own representatives of these banks. We demonstrate an exploratory view of the ten codes related by these banks (excluding context codes) in Table 3.

TABLE 3 – TEN CODES WITH MORE CITATIONS ABOUT INCUMBENT BANKS

<i>Code</i>	BB	% total	Bradesco	% total	Caixa	% total	Itaú	% total	Santander	% total	Total
<i>Partnerships</i>	31	22,1%	24	19,5%	3	12,5%	12	16,9%	5	9,4%	75
<i>New PS</i>	17	12,1%	12	9,8%	2	8,3%	12	16,9%	11	20,8%	54
<i>User needs</i>	15	10,7%	15	12,2%	2	8,3%	10	14,1%	7	13,2%	49
<i>Inflexibility of incumbents</i>	16	11,4%	10	8,1%	6	25,0%	6	8,5%	5	9,4%	43
<i>Sticky factors</i>	10	7,1%	12	9,8%	4	16,7%	8	11,3%	4	7,5%	38
<i>Bank branches</i>	8	5,7%	14	11,4%	2	8,3%	8	11,3%	2	3,8%	34
<i>Adjacent activities</i>	12	8,6%	10	8,1%	0	0,0%	3	4,2%	6	11,3%	31
<i>FinTechs</i>	8	5,7%	11	8,9%	2	8,3%	5	7,0%	5	9,4%	31
<i>Technological opportunity</i>	9	6,4%	7	5,7%	2	8,3%	5	7,0%	6	11,3%	29
<i>Open banking</i>	14	10,0%	8	6,5%	1	4,2%	2	2,8%	2	3,8%	27
TOTAL	140	100,0%	123	100,0%	24	100,0%	71	100,0%	53	100,0%	411

SOURCE: The Author (2020)

Although we cite the ten codes with more citations by incumbent banks, it is a natural process because the focus of this stage of research is qualitative, trying to find in declarations and analysis some insights to aggregate to the quantitative stage. We identify the number of each document and the excerpts in which they appear in the document in the format (document: excerpt).

This initial analysis shows that incumbent banks are most concerned about **partnerships** (75), **new PS** (54), and the **user needs** (49)⁸.

5.4.1 Analysis of annual reports from incumbent banks

The codification of the eight documents composed of financial reports and conference calls demonstrate a prevalence of **Digital Clients** (14) and **Digital Resources** (14). Table 4 shows the ten most-cited codes related to these documents according to each bank.

⁸ From this point we identify the names of the codes in **bold** to facilitate their identification.

TABLE 4 - TEN CODES MOST RELATED TO INCUMBENT BANK IN FINANCIAL REPORTS AND CONFERENCE CALLS

Code	Bradesco	%	BB	%	Itaú	%	Santander	%	Caixa	%	Total
<i>Digital clients</i>	5	12%	4	16%	4	25%	1	25%	0	0%	14
<i>Digital resources</i>	7	16%	3	12%	3	19%	1	25%	0	0%	14
<i>New PS</i>	0	0%	6	24%	3	19%	1	25%	0	0%	10
<i>Partnerships</i>	7	16%	2	8%	0	0%	0	0%	0	0%	9
<i>User needs</i>	1	2%	5	20%	2	13%	1	25%	0	0%	9
<i>Investments in IT</i>	5	12%	2	8%	1	6%	0	0%	0	0%	8
<i>FinTechs</i>	5	12%	1	4%	1	6%	0	0%	0	0%	7
<i>Incubator / accelerator</i>	7	16%	0	0%	0	0%	0	0%	0	0%	7
<i>Artificial intelligence</i>	3	7%	2	8%	0	0%	0	0%	0	0%	5
<i>Bank branches</i>	3	7%	0	0%	2	13%	0	0%	0	0%	5
Total	43	100%	25	100%	16	100%	4	100%	0	0%	88

SOURCE: The Author (2020)

Table 4 is a reliable source of information because it shows the coding of each bank commentary in their annual reports. The Bradesco exhibit concern about nine of the ten codes, excluding the new PS. Otherwise, we do not find mentions of any of the ten codes between the reports of Caixa. Below we make some observations (by each bank) on the total of 88 citations quotations about the most pertinent codes we analyze in the eight reports and conference calls.

In the beginning, **BB** is committed to increasing digital strategy focusing on reducing costs with its operational structure through **investments in IT** (1:1). These investments are an example of using **deep pockets** by incumbent banks to improve their operational efficiency (1:7). Despite its declaration, the document does not forecast the value of these future investments. It only presents the past investments in IT.

BB also highlights the increase of **native digital clients**, which start their relationship with the bank through its digital channels (an increase of 56% 2019). **BB** defines these clients as young people between 18 and 28 years old and university students (1:19).

Another way to **BB** increase its **digitalization** is by buying shares in digital companies. BB has a share of 12 PI payment institutions, including 49% of one digital bank called DIGIO (1:9). This example shows that when incumbent banks do not digitalize their structures, they can also participate in digital companies. These 12

companies use new technologies and do not necessarily share their systems with the incumbent bank **legacy systems** (125:2).

The transference of analogic to digital operations in **BB** (e.g., debt renegotiation in digital channels) includes **robot-advisors, artificial intelligence, chatbots, social networks, and partnerships** with Google Assistant to the customers carry out some of their financial transactions (1:24; 1:25).

Santander exemplifies its **digitalization** of PS in a multichannel platform as a strategy to increase digitalization (3:2). The bank offers a digital platform of investments Pi (including investments from other assets), debt renegotiations, and lending (3:4). Santander sees the banks in the future as a new type of a company denominated “**Bank tech**”, the combination of a bank and a FinTech (5:4).

The bank reinforces that it is **digitalizing** its intern analogical processes and that the platforms are a transformation in progress in the banking system. It represents a conversion from a financial system composed of banks offering their own PS to a financial market where will exist financial services of several suppliers offered in platforms (5:1; 5:3).

Itaú assumes the **digital transformation** as part of his strategic agenda and **future outlook** (7:5) and has a specific Digital Advisory Board board since 2017 to increase digitalization (7:6). The bank points out the reduction in the number of **branches** in 10.53% between 2018 and 2019 as part of a reduction in his **operational costs** (7:19). Itaú has IP to serve those clients without checking account by smartphone (7:14).

As the **BB** has participation in a **PI** (DIGIO), the Itaú has a specific **PI** to serve those clients without checking account (iti), which places the bank as a participant in the sector of payment accounts (7:14).

About the **rivalry** with new financial companies, Itaú recognizes the increase in the number of **FinTechs** and other types of companies and says these companies are bringing more dynamics to the Brazilian financial market (7:3).

The creation of his digital bank (**Next**) is the strategy of **Bradesco** to improve the **digitalization** of the company (10:8). The bank emphasizes that **Next** has a methodology focused on implement **open banking**. However, the report is not clear if the **Next** uses the incumbent **legacy systems** or new systems to run the digital bank. **Bradesco** also presents the innovation ecosystem called Inovabra, created in 2012, to **incubate** and **accelerate** startups (10:11).

Regarding **rivalry** with other financial companies, the bank recognizes the initial attempt of FinTechs to reply to incumbent banks. However, the bank recognizes that the Brazilian incumbent banks are going toward establishing **partnerships** with these new companies to increase the new PS offer. Also, **digital banks** can broaden their offer of PS in partnerships with **FinTechs** and startups (10:42).

As tools to enable **innovation**, **Bradesco** has an **Artificial Intelligence (AI)** system created jointly with IBM that interacts with customers and the employees of the organization. The bank also cites **blockchain, crowdfunding, and big techs** as sources of future **innovation**, tools not cited by the other four incumbent banks in their annual reports (10:22).

Finally, **Caixa** does not mention **FinTechs, digital clients**, digital strategies, or some similar in the two annual reports analyzed.

5.4.2 Valor Newspaper analysis

This section contains the analysis of the 118 articles of the Valor newspaper. We split the titles according to the codes related to them. Due to a large number of codes, we include the codes (excluding the context codes) with more occurrences. The relationship of these ten codes cited in the titles with the other codes (not necessarily on the top 10) appears in the text to allow a more fluent reading and not undermine the analysis.

Some codes are related to more than one subject, and we find some difficulties to fit them, such as those related to **APIs** and **partnerships**. Thus, we fit them in the way that they were mostly related to each specific section. In Table 5, we demonstrate the ten codes with more occurrences related to the incumbent banks.

TABLE 5 - TEN CODES MOST RELATED TO INCUMBENT BANKS ARTICLES OF THE VALOR NEWSPAPER

CODE	BB	%	Bradesco	%	Caixa	%	Itaú	%	Santander	%	Total
Partnerships	31	22%	24	22%	3	12%	12	17%	5	10%	75
New PS	17	12%	12	11%	2	8%	12	17%	11	21%	54
User needs	15	11%	15	14%	2	8%	10	14%	7	13%	49
Inflexibility of incumbents	16	11%	10	9%	6	24%	6	9%	5	10%	43
Sticky factors	10	7%	12	11%	4	16%	8	12%	4	8%	38
Bank branches	8	6%	14	13%	2	8%	8	12%	2	4%	34
Adjacent activities	12	9%	10	9%	0	0%	3	4%	6	12%	31
Technological opportunity	9	6%	7	6%	2	8%	5	7%	6	12%	29
Open banking	14	10%	6	5%	2	8%	2	3%	2	4%	26
New entrants	9	6%	1	1%	2	8%	3	4%	4	8%	19
TOTAL	141	100%	111	100%	25	100%	69	100%	52	100%	398

SOURCE: The Author (2020)

Next, we explain and make inferences about the codes, the content of the articles, and their relationships with the research subjects.

5.4.2.1 Partnerships

Partnerships are the efforts made by agents of the financial market (e.g., digital and incumbent banks, FinTechs, suppliers, and the public sector) to collaborate among themselves. Here, we expand the concept and include the codes of **mergers** and **acquisitions** in this section.

In the past (2015), with the imminence of the **digital banks** and **FinTechs**, the **IT** representatives of incumbent banks believe that regulators could mitigate these threats of **new entrants** in the Brazilian financial market. They claim that financial revenues were under threat, and incumbent banks operate under limited technological regulation (32:1).

Due to **low barriers** imposed by **regulators**, incumbent banks create partnerships to innovate and reduce the expensive operational structures of bank branches and legacy systems, which are not faced by digital companies (32:3). One solution to reduce these **sticky factors** of incumbent banks occurs by creating innovation spaces, starting in 2014 with InovaBra by Bradesco, which includes digital companies as suppliers of **adjacent activities** (32:2; 32:5). The **Itaú** has a similar center of entrepreneurship called Cubo, founded in 2015 (68:4).

The **partnerships** announced by incumbent banks in the future proposal of **open banking** activities are few and depend on the information from incumbent banks. Otherwise, there are strong **barriers** to these new **digital institutions** to obtain

information from **incumbent banks**. For example, since 2014, there is a law action between **Bradesco** and the financial advice **FinTech** **Guiabolso**, which demonstrates **barriers** to access of incumbent banks information about their clients (11:15).

In turn, on 04/01/2019, the Chief Executive Officer (CEO) of **Bradesco** has said that the bank "does not have afraid of **partnership**" (67:2). Otherwise, in the litigious process from Bradesco against the FinTech of financial advice **Guiabolso**, the Ministry of Fazenda stated that FinTechs like Guiabolso "contribute to the financial education" and cheaper credit" (67:4; 83:4). A representative of **FinTechs** association says that 2/3 of the new FinTechs in Brazil exist to collaborate or complement the portfolio of incumbent banks, not to compete with them (17:7).

Another FinTech representative thinks that the problem will be the resistance of the biggest **incumbent banks**, and the vigorous implementation of open banking will start with the medium-sized banks (52:6). To justify the resistance of incumbent banks, he cites the litigious between the **Bradesco** and the **Guiabolso** (52:6). Discussion on **data** sharing of clients is also a discussion about the clients as owners of their data, a topic discussed in the LGPD (76:2).

The digital business director of **BB** says that **financial advice FinTechs** only seek to use the structure and information of incumbent banks to capture profits, without the same level of **past investments** in technology and human resources, for example (76:4).

Another type of **partnership** is the offer of third-part products by other institutions. The commercialization of investment funds by incumbent banks started in 2018 with **Bradesco**, **Itaú**, and **BB**, which was an important milestone for this type of partnership. Financial market **analysts** see that the tendency is that incumbent banks become institutions like large department stores, which offer several types of **PS** of several **suppliers** to different clients (31:3).

The **partnerships** will depend on the willingness of **incumbent banks** more than **FinTechs**. New entrants do not always have the market power to convince the incumbent banks to build **partnerships**, although they have some of the technologies that the incumbents want. It can have a high cost for the **FinTechs** because the **incumbent banks** can transfer their operational costs through these **partnerships**. Then, enable new agreements will depend on the price system forces (31:3; 31:4).

A representative of **Itaú** recognizes that the **timing** of innovations of these banks in the past was too **slow**. Then, the speed and inclusion of new technologies in

incumbent banks can be achieved with the approximation with startups in **innovation spaces** using new resources (e.g., design thinking) (37:6; 37:7). In turn, **Santander** creates a specific digital transformation department (37:8), and **Caixa** launched in 2017 a program to stimulate new startups to deliver solutions to the bank (37:9).

Although they do not demonstrate a fast digitalization speed of their operations, some **incumbent** banks show some digitalization responses in the financial market. **Bradesco** and **BB** are partners in the PI Digio, that also have partnerships with other **FinTechs** and phone companies. It is an evolution in the **digitalization** of these two banks, showing search for flexibility through the creation and control of an independent IP (125:3)

Like other PIs, DIGIO looks to broaden its **portfolio** (125:6) and has no problems concerning the **rivalry** with the digitalized bank Next (**Bradesco**). Digio seeks the opportunity to be an open platform to commercialize PS from other companies (125:4). Like **BB** and **Bradesco**, **Santander** also has their PI, called Way (132:2).

As some Brazilian **FinTechs** offer only some PS, **digitalized/digital banks** and **FinTechs** build **partnerships** with medium-sized banks using **APIs** (82:7; 82:8; 127:2; 127:3).

The role of medium-sized banks in the innovation through partnerships and sharing **APIs** to increase the portfolio of these banks is bigger than the **incumbent** banks. Financial **specialists** of Bain Research Company emphasize this fact since 2017 (110:4; 115:5; 115:6). An example of a medium-sized bank exploring opportunities with digital financial companies is the Banco Votorantim (BV). The BV position themselves as a hub of financial services. The bank developed more than 390 **APIs**, and established agreements with several **FinTechs**, including companies delivering **adjacent activities** (64:4; 65:2).

Another example is microcredit. In Brazil, **BACEN** stipulates that part of the checking account balances must be applied in some credit operations as microcredit. However, **incumbent** banks can not always apply these mandatory resources in microcredit, an operation with lower default rates than personal credit (50:6). **Digitalized, digital banks, and FinTechs** believe that using these resources they can facilitate their inclusion in the market and retain clients (50:2).

The president of **BACEN** argues that the costs of microcredit operations are much lower when executed by **digital companies** than by the **incumbent** banks

(50:5). Despite this, **incumbent** banks resist transferring their resources to these new companies, an option available in the market. As a result, **BACEN** analyzes the regulation to allow that microcredit operations can be carried out from digital banks and FinTechs, with the consequent possibility of negotiating these credits with incumbent banks (50:3).

Despite the statements of the **incumbent** banks about the possibility of future **partnerships**, their representatives declare that the future of **partnerships** for new entrants will not be without cost. The CEO of **Caixa** details the charge of fees by incumbent banks in **partnerships** with digitalized, digital banks, and FinTechs.

Pedro Guimarães said that these new companies will “need to pay by the inefficiency of Caixa” in the **open banking** context. For the CEO of **Caixa**, it is not fair that new companies enjoy the structure of **bank branches**, **ATMs**, and **banking correspondents** without paying for them (60:2). However, other incumbent banks do not say like this, but their **rivalry** actions (e.g., Bradesco x Guiabolso) demonstrate an alignment with the discourse of Guimarães.

Specialists see **partnerships** as mutual relationships because new entrants need **incumbent** banks to increase their share, and incumbent banks (who have credibility as an **invisible asset**) need the fast adoption of technologies developed by **FinTechs** (27:2).

Paolo Sironi, a **specialist** in **FinTechs** and **AI** from IBM, says that digital startups will help the **incumbent** banks transition to a profile more related to service companies. The inclusion of **FinTechs** in the banking services will be a future challenge to the market in the future. Other challenges are the reduced need of **employees** until 2025 (50%) and the fall in revenues of banks, which will be faster than their ability to recover expenses and profit margins (78:2).

5.4.2.2 New products and services

This topic is related to creating new PS by the incumbent, digitalized, and digital banks and the innovative and competitive aspects of these actions.

At the beginning, the market **regulators** have restricted approval about PS to some **FinTechs**. However, the **regulators** begin to give opportunities for these companies to **expand their portfolios** (e.g., issuance of the credit card by SCD and SEP companies), increasing the possibilities of **competitiveness** or **partnerships** with **incumbent** banks (64:2; 69:2). The president of **BACEN**, Roberto Campos Neto,

considers that these innovations will increase the **banking of people**, reduce **concentration**, reduce the **asymmetry of information** in the financial market, and stimulate **competition** (16:6; 23:8).

Another example is the **CVM**. The regulator reviews some rules to stimulate the access of MPMEs to the stock market, increasing the transparency and the sharing of information to stimulate the **competitiveness** and increase the number of natural persons in the stock market (16:6; 23:8). **Public consultations** are often used by Brazilian financial market regulators to create or modify laws involving the scope of digital banks and FinTechs (84:4).

Although the difficulties of implementing **innovation** due to their condition as a public company, **incumbent** banks pioneering **financial advice** services with the **BB**. In 2017, the bank included the option "Minhas Finanças" in the bank app (15:2; 15:5).

Santander sees the future of incumbent banks as **platforms** of **PS** (101:5). **BB** emphasizes that 60% of the car financing operations in 2019 were performed through their digital app (101:7). **Digital banks**, in turn, already sign partnerships for **products** that do not yet exist with traditional institutions, such as insurance companies (102:2).

About the new service called **PIX**, launched on 10/16/2020, **specialists** think that, although reducing the price of money transfers between financial institutions, reducing costs can impact other PS (120:4). The international experience shows that the withdrawals in **ATMs**, for example, reduced from 4% to 16% in the year between 2014 and 2018 with a similar service (120:5).

The expansion of the portfolio of companies that started offering a few products, as acquirer companies, has been called a Trojan horse by the financial market (121:2). As an advantage, these new acquirers companies can use the amounts to be received in the future by their Point of Sale (POS) holders to offer credit operations (121:6).

In June/2016, an article shows that incumbent banks had a discourse of opening to **new technologies** and **partnerships** (68:7). The regulation 4,480/2016 by **BACEN** facilitates open bank accounts in a wholly digital process without the client attending a bank branch.

The **creation of products** offered by incumbent banks also can be influenced by external players as the **ATMs suppliers** (79:3). For example, Tecban, the biggest

ATM network in Brazil, created a service based on the generation of a **QR Code** that allows a person who does not have a bank account can withdraw money using that code (79:4).

The interaction with **social networks** is also a way to broaden the **portfolio of services** offered by financial institutions. Even before the PIX implementation, Facebook tried to start a digital payments system with Cielo, which has as majority shareholders **Bradesco** and **BB** (30.06% and 28.65%, consequently) (56:2). However, the **BACEN** determines the end of payments through WhatsApp to avoid problems arising with **BigTechs** actuation. **BACEN** will launch a specific **regulation** to stimulate interoperability among institutions and avoid **concentration**, as occurred with the WeChat and Alipay in China (54:2).

The issue of **concentration** also happens due to the credibility of **BigTechs** and their reputation, contrasting with some **digital banks** and **FinTechs** (93:3). **BigTechs** believe that the payments category is the key to obtain information about potential clients, mostly about their habits. Then, **payments** can be the initial category experienced by these big companies (93:5).

Then, if WhatsApp had successfully entered the **Brazilian** financial market, it would anticipate solutions planned even in the future **open banking** implementation (54:4). At first glance, despite sounds like an obstacle to innovation, the agreement between the **BigTech** and incumbent banks could create a high concentration level by their participants (56:3).

Creation and acceleration on the implementation of new **PS** also happen due to environmental conditions. At the beginning of 2020, the Covid-19 create a situation that accelerates the **digitalization** of incumbent banks and the adoption of **digital PS** by their clients (41:3). The CEO of **Santander** in Brazil says the covid-19 signals the end of the industrial age (41:4). The **digital banks** and **FinTechs**, born in digital culture, enjoy the acceleration of the adoption of **digital PS** (e.g., contactless credit cards) by clients that once resist using these types of PS (41:13; 41:15; 124:2; 124:5; 124:6).

However, the fast adoption of digital strategies by **incumbent** banks can expose them to **errors** while delivering services to their base of clients. In turn, digital-born institutions are prepared for this type and the amount of demand for PS of digital clients. For the incumbent banks, **deep pockets** are advantageous in dealing with the problems posed by the fast adoption of digital strategies (41:6; 41:7).

For example, a few days of the month, the home office was a reality for **digital bank** employees even before the covid-19, using resources as a VPN. At **incumbent** banks, the home office was not so typical. Thus, with the isolation measures of the pandemic, digital banks were already prepared for remote working strategies, unlike **incumbent** banks (41:8).

However, only providing digital service possibilities to clients faces some difficulties in Brazil. Even when willing to use digital resources, some people have problems accessing the internet. This partial/total restriction on internet access has generated large customer lines at **Caixa branches** to receive emergency aid paid by the Brazilian government during the pandemic (41:10).

Because **digital banks** act as PI, not receiving checking account deposits, they have restricted funding and do not multiply money (as the incumbent and digitalized banks) to supply the economy more financial resources during the covid-19. Then, the role of **digital institutions** in situations alike is restricted to solve problems of clients without the need to go to a **bank branch** to solve their needs.

The funding issues of **digital banks** and **FinTechs** is an aspect that does not reach incumbent banks so hard. Some **digital banks** and **FinTechs** obtained financial resources to carry out their operations from medium-sized banks during covid-19 (41:12; 89:4; 136:6). Another problem of these **new entrants** is the increase of interest rates paid by borrowers during the crisis, as the default probability in situations alike, which can prejudice even more their funding (89:5).

Brazilian legislation hinders the creation of new banking PS, as the availability of more credit to customers. The inflexibility in the register of credit operations with real state collateral is one example. However, **BACEN** includes subjects like this in their future agenda to facilitate credit availability with real state collateral by **digital banks** and **FinTechs**, also using the sandbox mechanism (49:3). As the **BACEN** is part of the public sector (but independent), their suggestions of changes to the public sector facilitate the creation and changes in laws **involving new PS**, as the registration in notary services of credit operations with real state collateral, to raise the **competitiveness**.

Specialists think that new financial companies **capture revenues** from unsatisfied clients from **incumbent** banks (121:5). PagSeguro, one of these companies, purchase a small bank in January/2019 to broaden its operations (122:2). Then, the **FinTech** become a **digitalized bank** and can offer checking accounts and

a broad portfolio of credit operations, for example (122:3). Specialists also say that **partnerships** with non-financial companies are essential to digital banks and **FinTechs** raise their profit rates (97:6). It occurs because these new companies need to offer a **broad portfolio of PS** to their clients, not only digital accounts, consigned credit, and credit cards (97:7).

The incumbent banks recognize the role of **cultural change** to adapt to new (and old) clients. For example, the **Next (Bradesco)** uses Anthropologists to study the behavior of people in specific groups and, consequently, **the creation of PS** to reach this public (101:4). About clients and their need for different PS, the CEO of **Bradesco** says that the bank needs to think about what the client wants (103:4).

5.4.2.3 User needs

User needs are related to the demands of clients about financial services, motivates innovations Van Der Boor et al. (2014), and their identification is an entrepreneurial act (Abernathy; Utterback, 1978).

Digital banks also find in lower-income clients as part of their scope (23:12; 23:11). The digital bank Maré, from Rio de Janeiro, focuses on 50 million people without access to bank services as **bank branches, ATMs**, or correspondents to carry out their payments and other financial transactions (31:5).

Surveys conducted in Brazilian favelas (slums) relate that the lower the average income, the lower the degree of **people banking access**. Despite 28% of the respondents living in favelas, they choose the bank because they do not charge **fees**, and 22% choose banks with lower **fees** (35:5).

The CEO of **Banco Inter**, a digitalized bank with seven million of clients, says that 80% of the bank clients open their accounts by indication of third parties (17:4). In the customer service area, **digital banks** can have an advantage when opening new accounts because these companies are digital-born (17:5).

In March/ 2018, the bank J. P. Morgan conducted research to measure the processes and time needed to open accounts in incumbent and **digital banks** in Brazil. They figured out that **digital banks** are more **agile** and do not require personal procedures, only those performed remotely. Concerning incumbent banks, in three cases (**BB, Itaú, and Santander**), the researchers needed to go to **bank branches** to conclude the procedures (85:2). The J.P. Morgan research concludes that as

incumbent banks have **bank branches**, it creates prone situations to them fail in digital initiatives (83:5).

5.4.2.4 The inflexibility of incumbent banks

This issue is related to the work of **Hill; Rothaermel (2003)**, where not all **incumbent** firms change their behavior facing **new innovators entrants** and are they also are slow to recognize the threats posed by these **innovations**. The authors explain the **inflexibility of incumbents** using three factors: economic (market power and monopoly rents); organization theory (role of inertia); and strategy (strategic commitments).

The **inflexibility of incumbent banks** is higher in banks with state participation. Representatives of these two banks (**BB** and **Caixa**) claims that the public sector characteristics are obstacles to innovation, mostly to engage in a financial world with **digital banks**, **FinTechs**, and the **open banking** opportunities (14:3). This inflexibility is not about only new technological opportunities but also about **cultural aspects** of incumbent banks, and their behavior about reject, collaborate, or buy **FinTechs** (83:2; 139:3).

The transfer of technology through **partnerships** with **FinTechs**, including the availability of back-office services, is a future solution to reduce the **inflexibility of incumbents** (43:4). **BB** is an example of these **partnerships** in the pension plan and consigned credit with payroll discount credit operations (45:3; 46:2). However, the bank thinks that these **new entrants** have better and unequal conditions to compete in the market, which can not be beneficial to **incumbent** banks (44:3; 58:5), according to the CEO of **BB** (47:1).

The **APIs** opening is an issue in the financial market since June/2017 (66:4). This issue is a question reinforced by an **IT** company representative that supplies open banking system to **FinTechs**. He claims for regulation more like the European, where the communication with **APIs** is less complicated, which results in benefits for the clients (52:5). The representative of **Santander** says the first moment for banks (around 2015) was to avoid the use of **APIs**. Nevertheless, they want to avoid using their **APIs** by other companies to avoid losing clients (66:3).

Representatives of **digitalized, digital banks, and FinTechs** agree that **incumbent** banks are concerned these new companies can reduce the profit of **incumbent** banks using **APIs** and offering low-interest rates. **Incumbent** banks pose

issues about information security when sharing data with third agents. A **FinTech representative** says that these banks use security as an argument to **create barriers** to **new entrants** in the financial market (76:3). The pricing of **APIs** maintained by incumbent banks is also a possibility (115:2). For a specialist in banks, the use of **APIs** is a condition to the **digitalization** of incumbent banks (66:2).

As the SEP/SCD created by BACEN, new regulations also allow that P2P **FinTech** companies do not need a bank to carry their credit transactions. This excludes a **third part** from the transaction and, in the long run, can bring a reduction of the interest rates for their clients due to the efficiency gains, according to a representative of the **FinTech** Nexoos (123:4). Another executive of a P2P company (Mova) believes that **FinTechs** have space to grown-up before entering into conflict with **incumbent** banks because these new companies can complement the **portfolio** of these banks (123:3).

The *Secretaria de Promoção da Produtividade e Advocacia da Concorrência* (SEPRAC) of the Ministry of Finance says these **digital advice companies** act as a correction of imbalances tool in the financial market. He also claims these companies can contribute to **financial education**, reduce the probability of default, and reduce the interest rates for borrowers (52:7; 58:8).

The availability of **human resources** with a technical profile is also a difficulty posed to **incumbent** banks. As the staff, these banks are traditionally composed of **employees** of the university fields of economics and business administration, the technological skills of their employees is a challenge. In **BB**, for example, the office clerk is the initial function in their public tender, a function not straight related to technology (43:3).

Finally, even with the new agents, traditional credit card issuers raise their **fees and rates**. Between the years 2016 and 2018, the average fees increased by 15.1%. (13:3). Incumbent banks believe in their marketing and position to perform these types of actions (13:3).

5.4.2.5 *Sticky factors*

Sticky factors derive from the economic concept of sunk costs. They represent investments in durable, specialized, and non-tradable assets (Peteraf, 1992). In banks, most of these types of factors are the operational costs.

Operational costs carried out by incumbent banks come partially from **their bank branches, human resources, legacy systems**, and operational structures to attend their clients. Using digitalization as an argument, **incumbent** banks can reduce their number of **branches** and **employees**, some of the most expensive **sticky factors**. The lack of **bank branches** in **digital banks** can reduce their costs. These institutions do not have **legacy costs** or those related to the maintenance of brick and mortar bank **branches** (11:7).

Data from June/2019 shows a negative balance of 2,1 thousand **employees** in the first semester of 2019 in the bank sector. From the year 2013 until the end of the first semester of 2019, this sector had a negative balance of 62.7 thousand employees (38:1; 135:2). In 2019, **Caixa, BB, and Itaú** announced volunteer dismissal programs (135:4). A specialist says that the loss of jobs is a phenomenon structural, not cyclical. However, the specialist thinks that these losses are already low, considering the buffer of the jobs in the sector (135:7).

The **ATMs** and their costs are **another sticky** factors indirectly financed by incumbent banks. The use of **ATMs** services by clients of **digital banks** and **FinTechs** is another concern of **BACEN**, which criticizes the high prices charged by **ATMs** companies (53:2). The biggest company of **ATMs** in Brazil (TecBan) is owned by the five biggest incumbent banks, which can pose **barriers to entry** to **digital banks** and **FinTechs** through the charge of high costs. Part of these five banks have **ATMs** operating without interoperability and with a low number of transactions by each machine. In this subject, Brazil is a unique case in Latin America (53:5; 53:7).

About the reduction of costs of incumbent banks through digitalization, the influence of **Bradesco** in the digitalized bank **Next** is a concern of a lending **FinTech** representative (Lendico). Marcelo Ciampolini, the founder of Lendico, says that it will be difficult for an incumbent as Bradesco does not influence the **Next** (83:5; 83:7). The representative of Lendico says that if **Next** only lower fees and rates will be not enough because new clients do not like to spend their money on financial transactions (83:7). In September/2019, 80% of new clients of **Next** did not have an account in **Bradesco** before **Next**. Besides, 75% of them are younger than 35 years old (36:5).

Although sharing back-office and **their legacy** systems with their digital bank, **Next**, the member of Bradesco board, Mauricio Machado de Minas, said in June/2016 that **Next** would be independent of **Bradesco** (58:2). Besides, he said that other

medium-sized banks, as the digitalized bank **Original**, are very similar to incumbent banks (58:3).

However, during a conference in June/2017, the same representative confirmed that the **Next** use the same back office that the incumbent **Bradesco**, a bank created in 1943. The member of the board justifies it "*because it made no logical to build another (back-office)*" (83:6).

Financial market specialists disagree with the attempts of **Bradesco** to present the **Next** to the market as a digital bank. These specialists say that incumbent banks need to create independent **digital banks** to eliminate the relationship with the **legacy systems** of the incumbent they own them 97:5).

5.4.2.6 **Bank branches**

Bank branches are the physical spaces where attend their clients. In Brazil, **bank branches** are related to the size of incumbent banks due to the geographical characteristics of our country, as some PS only can be carried out physically. Digitalized/digital banks do not have **bank branches** (generally), one of their essential differences between them and the incumbent banks.

Different than in the past, **bank branches** are considered nowadays sometimes as a non-competitive advantage of banks. In June/2019, a BTG Pactual digital (medium size) representative said **digital banks** have operational costs and investments in **brick and mortar branches** 80% lower than the incumbent banks (12:14; 12:6).

The incumbent banks have been under pressure to reduce their **operational costs** faced with a scenario of reduction in interest rates; part of these costs are produced by their **bank branches** (97:4). The **closing of bank branches** results from digitalization and the profile of the **new entrants** in the financial market (57:3).

In discussing reducing **bank branches** to improve the efficiency indicator, some Brazilian **cooperative banks** act differently. The representative of Sicredi, the second-largest Brazilian cooperative bank, says that, as the financial transaction tends to be standardized in the future, the physical relationship will be a competitive advantage (72:1).

Although the low processing demand and the **high costs** of transactions in brick and mortar bank branches, **Bradesco** argue that **branches** complement other channels and can not be excluded from their plans (63:5; 103:3).

A **survey** with 1.631 persons in Brazil in July/2019 by a market research institute Qualibest shows that 81% of the internet users consider important or much important the existence of **bank branches**⁹(91:2). One of the research conclusions is that education about financial services is essential to **digital banks** and **FinTechs** to convince new clients to use their services (91:3).

A Vice President of **Bradesco** thinks the substitution of brick and mortar **bank branches** does not happen so fast (137:2). A representative of **Bradesco** says that some costs are due to the Brazilian geography. Thus, if **bank branches** do not need vault and cash, these units could cost much less than the traditional branches (137:9). Itaú has tested this model. However, the representative of Itaú says that **closing bank branches** now is not the solution (137:10). However, the CEO of **Itaú** denies the existence of **inefficiencies**, but great potential for efficiency gain with the use of technology (e.g., cloud systems and machine learning) (137:8).

A specialist says that banking is still done in Brazil as the 70s (137:3). The specialist also says that the index of efficiency most used by **Brazilian** incumbent banks creates a false sensation of **efficiency**, blurred by the high banking spreads (137:3).

5.4.2.7 Adjacent activities

We define **adjacent activities** as those that non-banking companies also offer (e.g., financial advice, consortium, insurance). We adopt the concept of **adjacent activities** from Oliveira; Von Hippel (2011). Although there are some similarities with the vertical integration theory, our criteria are slightly different from it. In turn, in this research, we define core PS as that only can be carried out by banks or by the force of Brazilian regulation (e.g., checking account).

A example of **adjacent activities** by Brazilian banks are the agreements with the public sector to provide access to the entrepreneurs formalizing their situation. Some incumbent banks also reduce their fees to MPMEs looking out to retain clients (39:4; 39:5).

Incumbent banks also offer **loyalty programs** where the usage of PS is converted to reward points. In turn, **digital banks** and **FinTechs** offer money discounts

⁹ Available at <https://www.institutoqualibest.com/wp-content/uploads/2019/06/Finan%C3%A7as-Pessoais-V5-Banking-Fintech-Insights.pdf>

(cashback) to their clients to use their PS (87:2). As a refund in cash of a percentage of the expenses of their clients or consumption of products used in the bank, the cashback seems more transparent to clients than reward points programs.

However, although some banks announce reducing **fees** to the public, the rules to obtain discounts are not easy to accomplish. Among the requirements of the banks are a need for a minimum monthly amount in a checking account and the need to choose the services that the companies will benefit (19:1; 39:6; 62:5; 62:6).

Situations alike show the lack of transparency and difficulties posed to clients of incumbent banks. An exception is the free charging of **fees** by one of the credit cards of **Itaú**. The bank recognizes that some clients do not want complexity in the free pricing of PS (62:7).

In addition to their **lower costs**, some digital banks and FinTechs of big Brazilian retailers create **adjacent activities** to create incentives and get new clients. These incentives are given in shopping vouchers for future purchases, motivating clients to transfer money to digital wallets, for example, and buy in the retailer store (124:8).

BB offers another example of **adjacent activities**. The bank established agreements for clients to pay bus/subway ticket payments using NFC technologies and transference of a part of the customer relationship from phone calls to **social networks** (WhatsApp), with reduced waiting time (1:7; 1:8).

5.4.2.8 Technological opportunity

Technological opportunity is those that banks must have to create new PS or improve the already existents, being related to how any business deals with new technology.

Until the year 2016, the initiatives of incumbent banks to their **digitalization** were more related to **offer digital access** to their already physical service means, as videoconferences and smartphone access. These innovations are **incremental** because they do not change the profile of the PS of these institutions, only allowing different options to access the already existent services. Some exceptions are the creation of Cubo, an innovation space by **Itaú**, and the adoption of the digital wallet Samsung pay by **Santander** (100:1).

Smaller and medium-sized banks are more willing to open their systems to **APIs** jointly with **FinTechs** and **digital banks** to achieve different clients. These banks

also create **innovation labs** to innovate with other companies, as the **Original** bank (19:4). A representative of the institution said that the bank offers **products of third parts** since 2017 (139:4) and intend to be seen as a “bank as a service” in the future (136:3).

A representative of the Original says that, in September/2019, 86% of customer attendance was carried out using **AI** (36:4). In 2017, a representative of the same bank said that, in five years, the financial industry will switch strongly, and the **leading players** will be others due to technological opportunities (77:5). The adoption of **AI** resources allows banks to attend many clients and achieve **economies of scale**.

A representative of **Santander** recognizes that the **digital transformation** will reduce the queue delay for their clients. However, he does not mention **partnerships** as a possibility for this digital transformation (77:3).

On the matter of **human resources**, **digital banks** and **FinTechs** are also a destiny to senior executives of the banking sector. They look out essentially for work with innovation and autonomy in their decisions (72:3). The transfer of knowledge between senior executives and young workers and the need for skills to look at the whole picture in several sectors is another factor in these decisions (73:4; 73:6).

The **flexibility** of digital banks and FinTechs can be used even in traditional products, like those related to the rural credit operations (94:1), and in products of credit with low risk, as the consigned credit, acquired by **new financial institutions**. This type of credit has a historical of high competitiveness between the incumbent banks due to favorable characteristics of these credit operations (71:2).

Regarding the problem of **legacy systems** used by incumbent banks, financial analysts say that systems created some decades ago do not are used by **digital banks** and **FinTechs**. These new companies offer solutions based on new systems that reduce the bureaucracy in the customer service, a source of revenue of incumbent banks (80:2).

5.4.2.9 Open banking

Open banking is the sharing of data on PS offered by participating institutions, customer personal data, customer transactional data, and payment services. It requires the opening and integration of platforms and infrastructures of information systems. In Brazil, BACEN use **open banking** to instigate easier and cheaper financial services.

The concentration in the banking sector is one of the concerns of **BACEN**, which creates alternatives like open banking to allow that more people have access to banks and reduce interest rates through the stimulation of competitiveness (61:2).

Representatives of incumbent banks see **open banking** as one **opportunity** to improve the use of data they already have about their clients. The expected result is that **open banking** will be a tool for incumbent banks to improve their relationship with their clients and partners. According to a **specialist**, investments in marketing, for example, will be carried out by these partners (33:4).

Even with the broad possibilities with open banking, incumbent banks are not required to adopt a standard model in their **APIs** development, which can difficult access to **new entrants** using **open banking**. **FinTechs** representatives believe standardization is a way to reduce the technological costs and increase the scale of their operations; however, the market power of incumbent banks can prevail and impose more **barriers to entry** (30:1).

A member of the board of Bradesco declares that **open banking will bring opportunities** to banks to offer more **PS**, not necessarily related to financial products (42:3). The same bank CEO considers the open banking much more disruptive than **digital banks** (103:2).

The **IT** director of **Itaú** and a representative of **Bradesco** thinks of **open banking** as an opportunity to improve the use of data owned by banks. (42:8; 42:5).

The **IT** director of **BB** says that, in **open banking**, the incumbent bank which makes the right **partnerships** will win (42:4). The **BB** representative says that **open banking** is not only a matter of open the infrastructure, but this infrastructure also needs to be more flexible (42:6). The CEO of **BB**, in turn, says that **open banking** will bring benefits, but the liquid result will not be good because the **new entrants** as **digital banks and FinTechs** have unequal conditions to compete (136:5).

The costs of **APIs** that can be posed by incumbent banks face the use of their data are also a concern of representatives of **FinTechs** (48:5). The problem is not only to open data to new companies but also to make this type of information available to **digital banks** and **FinTechs** entering the **open banking** universe without traps. For example, representatives of **Itaú** and **BB** argue about the adoption of a **technical standard** to provide the traceability of information about clients, which be one of these "difficulties" in the future (42:7; 46:4).

These technical standards of **APIs** to be implemented have been evaluated since 2018 by **BACEN** (48:2). Although implementation on open banking is not yet active, **BACEN** suggests that some institutions, such as **BB**, start partnerships with **FinTechs** to improve their experience in this new model (48:3).

BACEN shows that **open banking** aims to reduce the **information asymmetry** for clients, including the availability and transparency of the costs and prices of the products offered by financial institutions. In the **first step** of **open banking**, **BACEN** forecasts the creation of third parts that will compare these prices and costs to clients who make their choices (116:9).

In the **second step**, **BACEN** says that other institutions will know about the situation of non-clients (e.g., demand for lending) and offer their products to these non-clients. The institution argues that **open banking** will help fix **market failures** (116:1). A **supplier** of open banking platforms says that the public consultation written by **BACEN** avoid that financial institutions difficult the access to client information when allowed by these clients (116:12).

5.4.2.10 New entrants

During COVID 19 pandemic, **BACEN** tried to create a "digital correspondent" using **FinTechs** and accrediting companies to distribute government assistance resources to MPMEs. However, **BB** and **Caixa** resist this idea. They argue that the operation is complex, and so they created one more **barrier to entry** to **FinTechs** and acquirers companies (20:2).

The president of **BACEN** says the digital changes **break these barriers** and make it easy to access the financial system (142:2). The digital correspondent, proposed during the Covid-19 by **BACEN**, have been already created by **Caixa** in 2018 (82:10).

The collection of bills by **digital banks** and **FinTechs** can expand the portfolio of PS of these new types of companies (118:4). However, the liberation of these services generates resistance by the incumbent banks. They argue that the collection of bills, despite their **revenues**, generate **operational costs** (e.g., bank branches maintenance) (118:5).

In the new model, the centralization of these payment collections is being studied, allowing **digital banks** and **FinTechs** to enter this service. Despite the

revenue generated by these payments, the incumbent banks argue that receipt generates high costs for the **bank branches**. (69:4).

Specialists reinforce that the Brazilian banking system does not have a strong level of **competitiveness** (74:1). In addition to the **concentration** of assets between the five largest incumbent banks, the **bank branches** concentration level of these banks achieves 90% in 2018 (74:2). Although it can be occur banking **concentration** in other countries, the Brazilian high levels of profit in comparison with other financial systems reveal a low level of competitiveness (74:3).

The inclusion of digital financial services companies in Brazil also occurs in **lawsuits** by these companies in government agencies against the five largest incumbent banks. An example occurred when **Nubank** challenged the five largest banks at the *Conselho Administrativo de Defesa Econômica* (CADE). Among the issues raised by the digital bank is the **difference in the treatment of payments** for the accounts of their clients concerning other companies, including delays in returning information and refusal to include credit card invoices in automatic debit, for example (112:2).

According to Nubank, the **banking sector concentration** is possible because these incumbent banks are verticalized, offering financial services, credit card acquirers, and brokers (112:3). Even a recruitment survey of strategic **employees** of Nubank by other banks, although the legislation does not prohibit it, difficult the digital bank operations (112:4). Problems of **concentration** also happened with acquirers companies (122:7).

However, it is not only the **digital banks** and **FinTechs** that increases the **rivalry** in the financial markets. The *Agentes Autônomos de Investimento* (AAI) also lend money to their largest clients and creating private credit mutual funds with the future receipts of these credit operations. Direct credit operation like these happens due to the reduction in the basic interest rate, determined by the rates paid by the government bonds. However, although the AAIs are not FinTechs, they act similarly, eliminating intermediaries like banks and their expensive operational costs (113:1).

Others examples **new entrants** are the phone companies that intend to act in a market of 185 million potential clients (140:2). The Telefonica company offers personal credit since 2019 for some of its clients in partnership with a digital bank (partner of **Bradesco and BB**) (140:3). Another phone company, Claro, offers personal credit since 2019 to their 26 million clients postpaid, offered by the Inbursa

Bank, owned by the same partner as Claro (140:4), and see future opportunities in areas as insurance, payments, and digital banking (140:5).

According to an **analyst** of Credit Suisse, the phone can be a way to the banking of people because these potential clients, mostly prepaid clients, have fragile relationships with their banks, and the phone companies establish confidence with them (140:7).

Using their **flexibility**, **digital banks** and **FinTechs** establish partnerships with non-financial agents, like retail stores, insurance companies, and other types of companies to broaden their offer of PS (23:8). These non-financial companies are **new entrants** that use new banking companies to build partnerships and to enter the banking market.

The availability of data of clients by incumbents can help to solve some old problems of Brazilian bank customers: the high-interest rates charged from borrowers. A **FinTech** representative says that 50% of these interest rates are charged due to the default. The partnerships between incumbent banks and FinTechs can reduce the **information asymmetry** and can be beneficial to customers, reducing interest rates to borrowers (48:4).

The opening of the capital of digital banks, FinTechs, and related digital suppliers in Brazilian market stocks is another evidence of the digitalization of the financial market and the **increase of rivalry** in the industry (80:3). The **CEO of Bradesco** recognizes the **competitiveness** of these new companies and argues that **new financial market entrants bother** and, in some cases, not of them can be denominated as **FinTechs** (57:4). In May/2018, the board member of Bradesco, Maurício Machado de Minas, declare that the **distribution of PS of third parts** by incumbent banks is more obvious because these new companies do good work in creating these PS (134:3).

The low costs for banking clients can exemplify the impact of these new companies. The fees charged by incumbent banks reduced from 29.7% to 27% of total revenues in the third quarter of 2019 (90:2). Specialists say that this reduction of fees is due to the existence of **new entrants**, as **digital banks** and **FinTechs**, and the **consequent rivalry**, in addition to the lower basic interest rates of the Brazilian economy (90:3).

As another example of the **rivalry of new entrants**, 20% (140 thousand) of workers transferred their salary receipts to accounts in **digital banks** seven months

after the possibility of wage portability (107:2). A financial market specialist says that clients demand agility and low fees and rates, mostly young clients (107:3).

The **Original bank** also motivates clients to transfer their salary receipts to the digital institution (130:2) and increase the volume of information about these new clients (130:4). Incumbent banks believe in their **broad portfolio** of PS and **bank branches** to retain their clients and avoid salary receipts losses to other institutions (130:6).

A director of **Santander** thinks that the fees charged by **digital banks** and **FinTechs** are unsustainable in larger banks, and these new entrants may raise their fees and rates in the future. Although he says the market is available for all types of institutions (107:8).

A Professor of *Fundação Getúlio Vargas* (FGV), Eduardo Henrique Diniz, says that some clients will initially keep their accounts in incumbent banks due to higher **credibility** when compared with the **digital banks** and FinTechs. The initial users of these new companies already know this world and are searching for lower **fees** and rates. According to the specialist, an alternative is that the banking sector can work charging for their services in a prepaid system in the future. The clients in this situation will pay in advance for future services, as transferences or money withdrawal (107:9).

Mário Couto, a Professor of *Fundação Instituto de Administração* (FIA-USP), thinks that the biggest incumbent banks will try to **improve the relationship** with their clients instead act to reduce their rates and fees (107:5). About **concentration**, a study of Febraban¹⁰ coordinated by the Economist Roberto Luís Troster shows that the number of clients of the five incumbent banks reduces from 72.3% (2014) to 64.5% (2018).

An ex-president of BACEN, Gustavo Loyola, says that the banking **concentration** is not an explication to the high spreads in Brazil. Other factors cause these spreads. However, he says that the **digital banks** and **FinTechs** are not able to solve the spread issue due to the structural problems, which reflects in the pricing of interest rates paid by borrowers (106:5).

¹⁰ Available at <https://www.institutomillennium.org.br/a-concentracao-bancaria-no-brasil-de-2014-a-2018/>

6 QUANTITATIVE ANALYSIS¹¹

The quantitative analysis is the second analysis of Mixed Methods. In this analysis, we have two sections with five subsections each.

The first section describes the previous steps of the statistical analysis, as commentaries about financial data, sources of data, the context of the analysis, procedures for dataset cleaning, and the methodology we applied.

The second section looks to answer five research questions about PS, their fee prices, types of technologies, institutions that offer these PS, relationship between the fees and the type of technologies, and compare Bradesco vs. Next

We build a dataset with information from five sources. Using this dataset, we perform statistical analyses using the logistic regression model. We estimated the model via maximum likelihood and presented the results in odds ratios scale.

As the qualitative, the quantitative analysis is also a part of the metainference and the conclusions of the present work.

6.1 PREVIOUS STEPS OF ANALYSES

This chapter contains explanations about financial data, data sources, context, dataset cleaning, and the methodology adopted on the statistical analysis.

6.1.1 About financial data

The collection and analysis of data in this work present two distinct but related challenges. The first concerns that digitalized and digital banks are a new research topic in the financial industry and do not present robust and reliable data, such as information about their activity or financial results. On the other hand, data about incumbent banks are easy to find. Incumbent banks are publicly-held companies with shares listed on the stock exchange, then this type of information is mandatory.

We have asked ABFintechs for a detailed Financial Statement of FinTechs, but they reported that all available information is on the association website.

¹¹ The content of this chapter was supported by the Statistician Guilherme Pereira da Silva (<https://gpestatistica.netlify.app/>).

6.1.2 Sources of Data

We build our own PS dataset because we have not found similar data sources of Brazilian financial market data. Although we search in Brazilian (Periódicos Capes and Scielo) and international literature sources (Google Scholar, Scopus, and Web of Science) between 04/22/2020 and 05/19/2020, we do not find standard sources of data. We use the expressions: “banking products”, “bank products”, “banking services”, “bank services”, “banking portfolio”, “banks portfolio”. “*produtos bancários*”, “*serviços bancários*”, and “*produtos e serviços bancários*”. We also have not find any systematic information at government sites as: BACEN, CVM, *Instituto Brasileiro de Geografia e Estatística* (IBGE) neither on private association sites as ABFintechs, *Associação Brasileira das Entidades dos Mercados Financeiros e de Capitais* (Anbima), and other financial association. So, we decided to use multi-sources of data.

The papers search time period was restricted from 2015 to 2020, since many of the innovations available in Brazilian digital banks were available for this period. The most adherent literature is composed of textbooks about the financial market; for example, Fortuna (2015) and Pinheiro (2016). Although, these two books do not provide an updated and comprehensive set of PS.

To analyze the structure of PS in the Brazilian Financial System, we group data from five sources. As the final result, the dataset contains 237¹² PS. We also classify each PS according to three specific criteria of the literature and nine categories of PS, described in the FTCMA (Appendix A and Figure 87).

Aspects related to confidentiality and sensitive business information create difficulties in interviewing the incumbent bank representatives. Ruediger Kaufmann et al. (2012) describe a similar situation. The collection of most of the data relating to these types of companies comes from secondary sources. We build the dataset of PS from five different types of sources, as reported in Figure 35.

¹² The dataset of PS we analyze is available at <https://drive.google.com/file/d/1iOVZpwaY9cMWevtuKJFb21uNbg3GzH34/view?usp=sharing>

FIGURE 35 – SOURCES OF DATA COLLECTION

Name	Source	Definition	Update Frequency / Last Update
Bank fees table	Banks, based on the 3.919 and 4.196 BACEN and National Monetary Council Resolutions'	The PS classification based in a mandatory and public document published by the banks that entails the maximum fees that their charge for their PS	Daily
Web sites of banks	Banks	Information retrieved from the banks' websites and not available from the other documents/resources	Daily
Consortium	Circular 3.394 BACEN	Some Brazilian banks also offer consortium quotas for consumer and corporate clients, similar to goods financing operations.	07/09/2008
Investment funds classification	ANBIMA	Available investment funds according to a Brazilian market investment funds classification related to their characteristics of assets, duration, risks, and management styles and strategies	13/04/2015
Lending and financing	BACEN document 3050 and Circular nº. 3.870	Demonstrate the classification of the lending and financing operations, in line with the BACEN classification.	03/19/2018

SOURCE: The Author (2020)

It is not sufficient to collect data from a single source. We have started by elaborating a dataset based on the table of fees provided by BACEN. However, it does not cover the type of data that we aim to use in this work. For example, the investment funds and their categories are not described in the table of fees.

Besides, some of the documents from Figure 35 and sources of data are required by regulators as a condition to the legal operation of Brazilian banks. We consider this dataset to compare the existing structure with the supply of financial PS delivered by the new entrants. As an example of the use of websites of banks, Oliveira; Von Hippel (2011) also employ the analysis of the five biggest banks by assets and the websites as sources for some of the PS in their work.

Nevertheless, despite the effort to exploit all the PS made available by financial institutions in Brazil, the dataset may have limitations. One kind of constraint is the transparency of banks in disclosing their PS through their websites. We try to fill this gap by using other others sources of data beyond the banks websites, as tables of fees and available regulation.

Another concern is related to the level of detail that products can provide. To prevent these failures, we tried to include all the PS we found. However, specific negotiations between banks and their clients can subtly alter the characteristics of this

information, without radical changes in PS. Then, considering these constraints, the dataset covers most of the data about PS available in the Brazilian financial market.

We also categorize technologies applied in PS as “current” or “new” in the PS dataset. If an incumbent bank released a PS first, we call it an “current” technology. Subsequently, if a digitalized/digital bank initially launch the PS, we categorize it as “new.” We use Brazilian newspapers and magazines specialized in the financial market, and we describe these 15 new PS in Figure 11.

6.1.3 Context of the analysis

In this section, we demonstrate how we choose the categories of PS to analyze, and we pose two observations about the statistical treatment

We carry out the analyses according to the categories of PS and the type of technology employed (new or incumbent), as shown in Figure 11. We classify the PS offered by incumbent, digitalized, and digital banks (Figure 8) according to the FTCMA (Appendix A) and two works about financial innovation described in Figure 36, Figure 37, and Figure 38.

FIGURE 36 – CATEGORIES OF OLIVEIRA; VON HIPPEL I (2011)

Nº.	Name	Description	Example
1	No transactions	No financial transaction or money transfer by the bank is involved (without transactions)	Checking account balance
2	Transactions	Implementing the PS requires that a transaction must occur in which the bank system “does something” in response to instructions from account holders;	Money transfer
3	Channels	An action by both users and banks must occur: a functioning new channel between two parties requires that both parties have the appropriate transmitters and receivers and that both “staff” the new access channel	Direct bank access through a data link

SOURCE: The Author (2020)

FIGURE 37 – CATEGORIES OF OLIVEIRA; VON HIPPEL II (2011)

Nº.	Name	Description	Example
1	Core activity:	PS that only can be carried out by banks. We also categorize secondary results that depend on these core PS as well. Example: a checking balance depends on the existence of a checking account opening	Checking account
2	Adjacent activity:	Those activities that non-banking companies also offer	Consortium

SOURCE: The Author (2020)

FIGURE 38 – CATEGORIES OF BARBOSA; DE PAULA ROCHA; SALAZAR, (2015)

Nº	Name	Description	Example
1	Classic bank products	Related to credit offers, as the credit supply activities	Working capital
2	Other financial bank products	Non-lending financial products offered by a bank	Asset management
3	Other non-financial bank products	Products that are offered by banks and non-banking companies	Life insurance

SOURCE: The Author (2020)

At this moment, we pose two observations about the quantitative analysis:

1 - Although in the first moment the analysis was intended for each type of bank and the 237 PS offered or not by them (without categorization), it was not possible (but we tried). The main reason is that, when analyzing PS individually, there is great variability in terms of the frequencies and values practiced by each type of bank. We only perform some analysis by an individual product or service in the comparison between Bradesco and Next. In all other cases, we perform the analysis using the FTCMA categories model (Appendix A).

2 - Another initial objective was to analyze the variability in the price of PS offered. However, it was not possible to perform the analysis in this way. So, instead of carrying them out, considering the price of the service, we classified if the product is charged or not for each type of bank. Thus, we chose to analyze whether or not the bank charges the service (regardless of value). This is due to the significant variability in prices and some particularities in the type of charge (e.g., frequency, value spent, or pages provided).

6.1.4 Dataset cleaning

We made some adjustments before starting the work, which did not affect the final results, but could distort the results and make the statistical analysis of the data impractical:

- We categorize each PS offered by each company in the dataset: “Y” (offers PS at a free price or no charge); “N” (does not offer the PS); “M” (offers the PS, however, does not have the price disclosed or the different categories of PS hinder the comparison) and; “price” (the price of fee in Brazilian reais).
- For the analysis of the type of product or service offer (representativeness), we consider the entries “M” and “Y” as services offered by companies;
- The services classified as “N” (not offered) were classified as unavailable;

- For the value type analyses, the entry “M” (has the service but does not have the price divulged or different categories of services in the same product that prevent the comparison) is considered as not available. The entry “Y” (has the service but does not have the published price), then we consider it free-of-charge. The entry “Y” (has the service but does not have the published price) we consider as free-of-charge price;
- The service P23 - Cheque TB com valor igual ou superior R\$ 5.000,00 (vl. fixo + %) was excluded because no company offered the service;
- We summarize the categories of the PS type for each author using labels: Oliveira; von Hippel (2011); Oliveira; von Hippel II (2011); and Barbosa; de Paula Rocha; Salazar, (2015).

6.1.5 Methodology for the variable analysis

In the analysis of the dataset of PS, we consider that the two-variable answers follow a binomial distribution:

- The number of **PS offered** for each bank type and the category (from the three works or the type of technology) concerning the total number of the possible PS;
- The total number of **PS charged** for each bank type, and the category (from three works or type of the technology) with the total number of PS offered;

For all analyses, we follow the same standard (except for the comparison Bradesco-Next). Then, the methodology will be described only once (switching only the response variable and the categorization of PS).

Initially, we sum the number of PS offered for each type of bank and their categorization, as the total number of existing PS. We resume this information from a table (for a conference of the subsequent analysis) and the bar chart (descriptive analysis).

Then, we proceed with the fit of a **logistic regression model**. We consider the response variable as a proportion of PS offered to the interaction between the type of bank and the categorization of services (MENARD, 2011). In order to identify which covariates (or interaction) were not associated to the response variable, we use the backward variable selection via likelihood-ratio test considering 5% significance level. (CASELLA; BERGER, 2002). We also have the marginal likelihood as a result of the adjustment of the logit model.

Since we fitted the saturated model for the vast majority of models (with a number of parameters equal to the number of rows in the summarized data), the verification of the adjustment of the model quality was not necessary. We present the results of the fitted models using the estimates of the effects of the included covariates, their standard errors, Wald-type confidence interval (95%), and Wald test for the nullity hypothesis of such effects.

In the context of a regression model, when there is a covariate with more than two levels, it is necessary to make multiple comparisons among all levels to identify which levels differ significantly (for example, type of technology, with eight levels). When making multiple comparisons, the Type I error increases (the tendency is to reject more hypotheses $\sim p\text{-value} < 0.05$, even if they are not significant). Then, it is necessary to use some correction for the p-value to control this problem. In this case, we use **the p-value correction of Šidák (1967)**. This correction is similar to the popular Bonferroni. However, it penalizes less than Bonferroni.

We also calculate the **Odds Ratio** using a two-step calculation. Odds Ratio is a ratio between odds. Odds is the probability of success (in this case, offering the service) divided by the probability of failure/non-success (in this case, not offering the service). Therefore, Odds Ratio is a ratio between two odds.

We perform the statistical analysis using the software R version 4.0.3 (R FOUNDATION FOR STATISTICAL COMPUTING, 2020).

6.2 STATISTICAL ANALYSES

After explaining the previous steps of the statistical procedures, we demonstrate below the five statistical analyses and their results. We carry out five types of analyses according to Appendix A (FTCMA) and the previous explanations on Figure 36, Figure 37, and Figure 38.

We present a first sub-section (6.2.1) with a descriptive analysis using FTCMA (6.2.1.1), three categories of the literature (Oliveira and von Hippel I; 2011 (6.2.1.2), Oliveira and von Hippel II; 2011 (6.2.1.3), and Barbosa, Salazar, and Oliveira; 2015 (6.2.1.4) The second (6.2.2) comparing the fees using with the same previous four categories (6.2.2.1, 6.2.2.2, 6.2.2.3, and 6.2.2.4). The third (6.2.3) comparing the types of technologies. The fourth (6.2.4) analyzes types of technologies and their fees. Finally (6.2.5), we develop an analysis involving Bradesco and Next.

We summarize the structure of this section in Figure 39.

FIGURE 39 – STRUCTURE OF FIVE STATISTICAL ANALYSES

Section	Objective	Subsection	Subsection name
6.2.1	Quantify the presence or not of each of the four categories of PS	6.2.1.1	FTCMA Analysis (categories of Appendice A)
		6.2.1.2	Oliveira; von Hippel I (2011) no transactions, transactions, and channel
		6.2.1.3	Oliveira; von Hippel II (2011) core or adjacent PS
		6.2.1.3	Barbosa; de Paula Rocha; Salazar (2015) classic bank PS, other financial bank OS, and other non-financial PS
6.2.2	Comparison of the fees price of the PS for each type of bank	6.2.2.1	FTCMA Analysis (categories of Appendice A)
		6.2.2.2	Oliveira; von Hippel I (2011) no transactions, transactions, and channel
		6.2.2.3	Oliveira; von Hippel II (2011) core or adjacent PS
		6.2.2.4	Barbosa; de Paula Rocha; Salazar (2015) classic bank PS, other financial bank PS, and other non-financial PS
6.2.3	Compare the type of technology of PS (New/Old) for each bank	-	
6.2.4	Assess whether there is a difference between the amounts charged for PS in relation to the type of technology by groups of banks.	-	
6.2.5	PS offered by Bradesco (incumbent) versus Next (digitalized)	-	

SOURCE: The Author (2020)

6.2.1 Analysis 1 – Quantify the presence or not of each of the four categories of products and services (FTCMA and three of the literature) among the groups of banks

6.2.1.1 FTCMA Analysis (categories of Appendix A)

This analysis seeks to answer questions about the representativeness of each type of bank in relation to the types of PS.

Before results, we present the categories by type of bank:

- **Incumbents:** BB, Bradesco, Caixa, Itaú, and Santander;
- **Digitalized:** Banco Agiplan, Banco Inter, BS2, C6, Modal, Next, Original, Renner, and Sofisa;
- **Digital:** Banco Maré, BanQi, Hugpay, Livre, Nubank, Pefisa, Pinbank Brasil, Social Bank, and Superdigital;

Table 6 presents the absolute and relative frequencies according to the nine categories of FTCMA.

TABLE 6 – ABSOLUTE AND RELATIVE (%) FREQUENCY OF THE EXPERIMENTAL VARIABLE

Category	Frequency	Percentage (%)
<i>Lending</i>	63	26.6
<i>Payments and transfers</i>	61	25.7
<i>Digital banks</i>	51	21.5
<i>Exchange</i>	31	13.1
<i>Investments</i>	12	5.1
<i>Advice</i>	7	2.9
<i>FinTech</i>	7	3
<i>Insurance</i>	4	1.7
<i>Others</i>	1	0.4
<i>Total</i>	237	100

SOURCE: The Author (2020)

The most representative categories are Lending, Payments and transfers, Digital banks, and Exchange (86.9%). Then, these categories of PS will result in smaller confidence intervals for the estimates than if compared with the other categories (which is something positive, as there will be greater accuracy in the calculation of the estimate). As well, it will result in more consistent results (because it has a larger sample). Although we classify one service in the Others category, it will not be previously discarded because we group the analysis by type of bank.

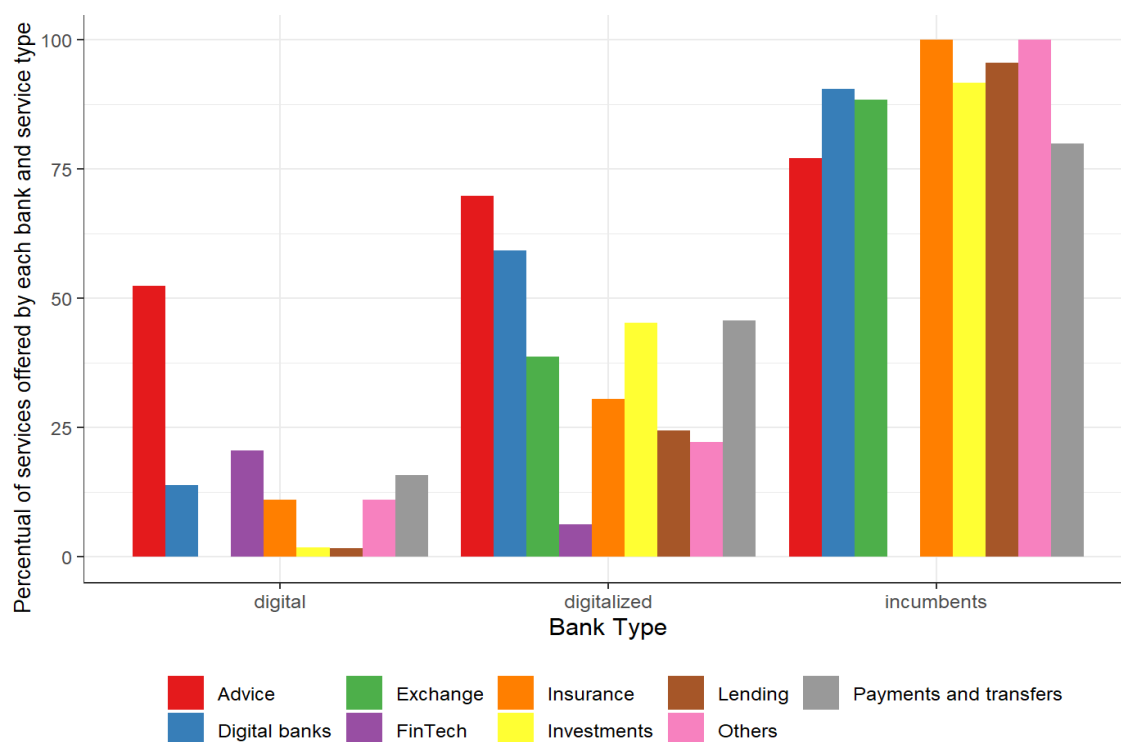
Table 7, Figure 40, and Figure 41 show the descriptive analysis of the percentage of PS offered for each type of bank, according to the FTCMA (Appendix A).

TABLE 7 - DESCRIPTIVE ANALYSIS ACCORDING TO FTCMA CATEGORIES

Type of bank	Category of PS	Total	Offered	Percentage	Not offered
Digital	Advice	63	33	52.38	30
Digital	Digital banks	459	64	13.94	395
Digital	Exchange	279	0	0.00	279
Digital	FinTech	63	13	20.63	50
Digital	Insurance	36	4	11.11	32
Digital	Investments	108	2	1.85	106
Digital	Lending	567	10	1.76	557
Digital	Others	9	1	11.11	8
Digital	Payments and transfers	549	87	15.85	462
Digitalized	Advice	63	44	69.84	19
Digitalized	Digital banks	459	272	59.26	187
Digitalized	Exchange	279	108	38.71	171
Digitalized	FinTech	63	4	6.35	59
Digitalized	Insurance	36	11	30.56	25
Digitalized	Investments	108	49	45.37	59
Digitalized	Lending	567	139	24.51	428
Digitalized	Others	9	2	22.22	7
Digitalized	Payments and transfers	549	251	45.72	298
Incumbents	Advice	35	27	77.14	8
Incumbents	Digital banks	255	231	90.59	24
Incumbents	Exchange	155	137	88.39	18
Incumbents	FinTech	35	0	0.00	35
Incumbents	Insurance	20	20	100.00	0
Incumbents	Investments	60	55	91.67	5
Incumbents	Lending	315	301	95.56	14
Incumbents	Others	5	5	100.00	0
Incumbents	Payments and transfers	305	244	80.00	61

SOURCE: The Author (2020)

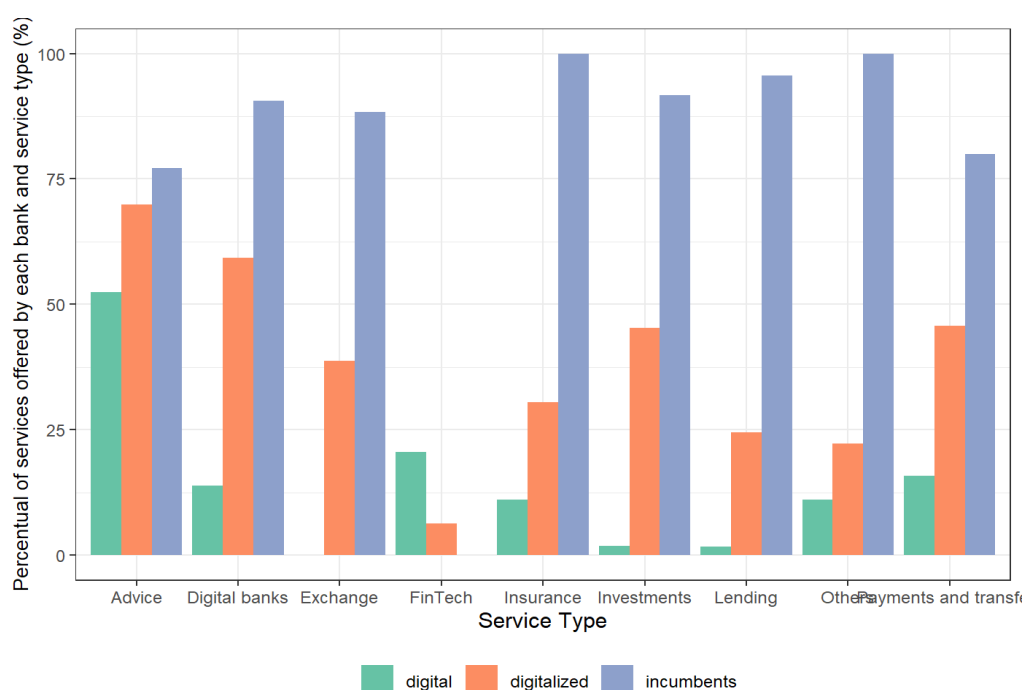
FIGURE 40 - BAR CHART OF THE PERCENTAGE OF EACH TYPE OF PRODUCTS AND SERVICES OFFERED BY EACH BANK ACCORDING TO FTCMA



SOURCE: The Author (2020)

The “Failure” column represents the total number of PS not offered (Total - Frequency). It is noteworthy that some PS are offered in all cases (incumbents & Others; incumbents & Insurance), and others, in none of the cases (incumbents & Fintech, digital & Exchange).

FIGURE 41 - BAR CHART FOR THE PERCENTAGE OF PRODUCTS AND SERVICES OFFERED BY EACH TYPE OF BANK ACCORDING TO FTCMA



SOURCE: The Author (2020)

The service type analysis starts on the first output (Table 7). It is the result of the complete analysis. From this table, it is also possible to check if the results presented here are coherent.

As an example, at first, there are nine digital banks and seven PS categorized as Advice. Thus, the total number of Advice services offered to customers by digital banks is 63 (9x7). However, digital banks offer only 33 (52.38%). Among incumbent banks, the percentage of Advice services offered is 77.14%, higher than digital and digitalized banks. The subsequent analyses will answer how significant this difference is.

Figure 40 and Figure 41, in turn, shows the content of tables quickly. While Figure 40 fixes the types of banks and compares the PS, Figure 41 fixes the type of PS and compares the types of banks. From Figure 41, we can see that the incumbent banks dominate the offer of almost all PS (except for Fintech, a category dominated by digital banks), and digital banks offer the least PS compared to the others.

In Figure 41, the offer of PS in the category Advice is similar among the three types of banks. However, for the other PS categories, each type of bank determines the differences.

The next results (Table 8, Table 9, and Figure 43) present the model results, in which the interaction between the bank type and the service category was significant through the fit of the logistic regression model. The probability of PS offer depends on both the PS category and the type of bank.

TABLE 8 - ESTIMATED MARGINAL PROBABILITY FOR EACH SERVICE CATEGORY AND BANK TYPE

Type	FTCMA category	Prob	SE	Asymp.LCL	Asymp.UCL
Digital	Advice	0.5238	0.0629	0.3759	0.6677
Digitalized	Advice	0.6984	0.0578	0.5459	0.8169
Incumbents	Advice	0.7714	0.0710	0.5635	0.8982
Digital	Digital banks	0.1394	0.0162	0.1051	0.1827
Digitalized	Digital banks	0.5926	0.0229	0.5369	0.6460
Incumbents	Digital banks	0.9059	0.0183	0.8522	0.9414
Digital	Exchange	0.0000			
Digitalized	Exchange	0.3871	0.0292	0.3202	0.4586
Incumbents	Exchange	0.8839	0.0257	0.8071	0.9327
Digital	FinTech	0.2063	0.0510	0.1100	0.3535
Digitalized	FinTech	0.0635	0.0307	0.0194	0.1888
Incumbents	FinTech	0.0000			
Digital	Insurance	0.1111	0.0524	0.0340	0.3072
Digitalized	Insurance	0.3056	0.0768	0.1564	0.5107
Incumbents	Insurance	1.0000			
Digital	Investments	0.0185	0.0130	0.0034	0.0940
Digitalized	Investments	0.4537	0.0479	0.3436	0.5685
Incumbents	Investments	0.9167	0.0357	0.7829	0.9711
Digital	Lending	0.0176	0.0055	0.0083	0.0370
Digitalized	Lending	0.2451	0.0181	0.2046	0.2908
Incumbents	Lending	0.9556	0.0116	0.9180	0.9764
Digital	Others	0.1111	0.1048	0.0098	0.6114
Digitalized	Others	0.2222	0.1386	0.0404	0.6596
Incumbents	Others	1.0000			
Digital	Payments and transfers	0.1585	0.0156	0.1247	0.1993
Digitalized	Payments and transfers	0.4572	0.0213	0.4070	0.5082
Incumbents	Payments and transfers	0.8000	0.0229	0.7397	0.8492

SOURCE: The Author (2020)

Table 8 presents the marginal probability of a specific type of bank offers a certain category of service. See that the “probability” column shows the same value as Table 7. The difference is that Table 7 presents the percentage, while Table 8 presents it in terms of probability (varying from 0 to 1). We also include the Standard error (SE) and the lower and upper confidence intervals of 95% (Asymp.LCL and Asymp.UCL). When all services were offered (or not), some rows contain only the filled probability column, as it is not possible to estimate a measure of variability.

TABLE 9 - ODDS RATIO BETWEEN BANK TYPE FOR EACH FTCMA CATEGORY

FTCMA category	Bank type comparison/contrast	Odds.ratio	SE	asypm.LCL	asypm.UCL	p.value
Advice	Digital / digitalized	0.4750	0.1771	0.1950	1.1569	0.1313
	Digital / incumbents	0.3259	0.1548	0.1048	1.0133	0.0538
	Digitalized / incumbents	0.6862	0.3343	0.2144	2.1962	0.8239
Digital banks	Digital / digitalized	0.1114	0.0184	0.0751	0.1651	<.0001
	Digital / incumbents	0.0168	0.0043	0.0092	0.0308	<.0001
	Digitalized / incumbents	0.1511	0.0354	0.0863	0.2646	<.0001
Exchange	Digital / digitalized					
	Digital / incumbents					
	Digitalized / incumbents	0.0830	0.0232	0.0426	0.1616	<.0001
FinTech	Digital / digitalized	3.8350	2.3133	0.9083	16.1917	0.0756
	Digital / incumbents					
	Digitalized / incumbents					
Insurance	Digital / digitalized	0.2841	0.1824	0.0613	1.3158	0.1425
	Digital / incumbents					
	Digitalized / incumbents					
Investments	Digital / digitalized	0.0227	0.0168	0.0039	0.1328	<.0001
	Digital / incumbents	0.0017	0.0015	0.0002	0.0131	<.0001
	Digitalized / incumbents	0.0755	0.0382	0.0226	0.2524	<.0001
Lending	Digital / digitalized	0.0553	0.0184	0.0249	0.1226	<.0001
	Digital / incumbents	0.0008	0.0004	0.0003	0.0023	<.0001
	Digitalized / incumbents	0.0151	0.0044	0.0076	0.0302	<.0001
Others	Digital / digitalized	0.4375	0.5817	0.0183	10.4654	0.8989
	Digital / incumbents					
	Digitalized / incumbents					
Payments and transfers	Digital / digitalized	0.2236	0.0324	0.1582	0.3160	<.0001
	Digital / incumbents	0.0471	0.0087	0.0303	0.0732	<.0001
	Digitalized / incumbents	0.2106	0.0351	0.1414	0.3136	<.0001

SOURCE: The Author (2020)

Table 9 compares the offers among bank types for each category using the Odds Ratio. Here, we make the two-step calculation.

In the first row of Table 9, for example, the Odds for the Advice service category in digital banking is $.5238/(1-.5238)=1.099958$, i.e., the greater is the chance (1.1 times) that digital banks have offered an Advice service category than not offering. The Odds for the Advice service category in digitalized banks is $0.6984/(1-.6984)=2.31565$, that is, a greater chance (2.31565) of a digitalized bank offering an Advice service category than not offering.

In the second stage of the Odds Ratio calculation, we divide the two Odds, the digital Odds by to the digitalized one: $1.099958/2.31565=0.4750105$. Then, the chance of a digital bank offering a higher proportion of Advice services is 0.4750105 times the chance of a digitalized bank (interpretation of the 1st row of Table 9). As this value is <1 , we conclude that digitalized banks offer more of this type of service than digital ones. However, this difference was not significative because the p-value = 0.1313¹³,

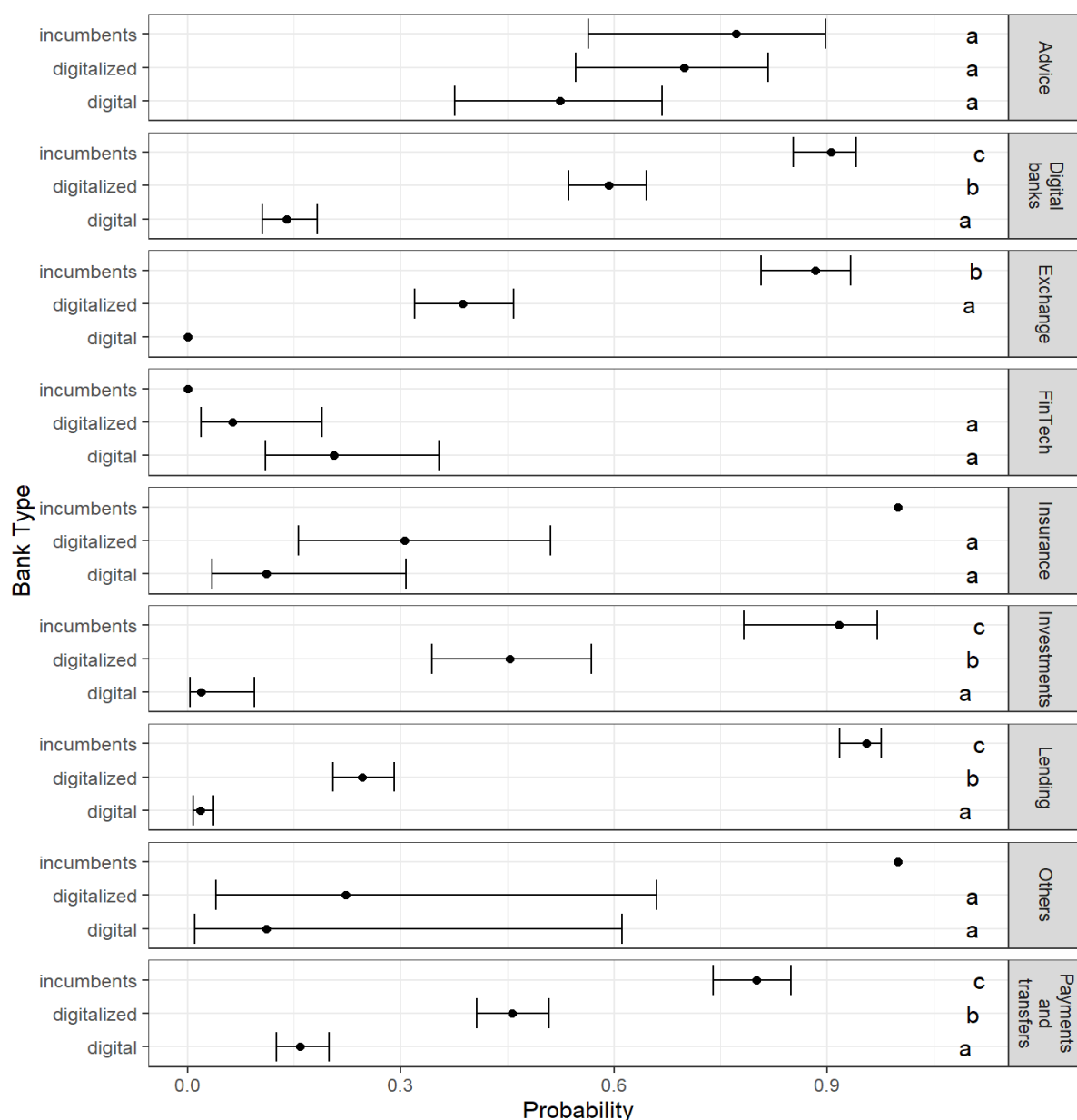
¹³ In the present work we adopt statistical significance when the value $-p<0.05$, while values $-p\geq 0.05$ indicate no statistical significance.

that is, statistically, the proportion of Advice type services is the same between digital and digitalized banks. Another way to interpret the Odds Ratio is as follows: the chance of a digitalized bank offering a higher proportion of Advice services is $(1/.475)=2.1052$ times the chance of a digital bank.

We found that no type of bank prevailed for services in the Advice category. For digital banks, the incumbent banks offer the largest proportion of these PS (this also happens for the categories Exchange, Insurance, Investments, Lending, Others, and Payments and transfers). Note that the comparison for Insurance and Others does not appear in the table. This happens because the incumbent banks offer 100% of this category, making the Odds calculation impossible. However, it does not mean that they do not offer these two PS. On the other hand, the incumbent banks do not offer any Fintech type service, and the Odds Ratio of the PS offer between the digitalized and digital banks is not statistically different.

The interpretation of each row in the table is possible, however, it is too exhaustive. Therefore, we decided to summarize these results in Figure 42. Thus, Figure 42 facilitate these comparisons in a clustered way using the FTCMA.

FIGURE 42 –MARGINAL PROBABILITY ESTIMATED BY THE MODEL OF EACH PRODUCTS AND SERVICE BEING OFFERED BY A BANK CATEGORY



SOURCE: The Author (2020)

In Figure 42, each black dot represents the probability of each type of bank offering a particular PS category. The black interval represents the confidence interval associated with this probability. When the interval does not appear, the PS category offered is 0 or 100%. Equal letters indicate no statistical difference for each type of bank, while different letters indicate a statistical difference in the probability of offering more PS.

Likewise, the category Advice contains the letter “a” three times because the services do not differ. In the Insurance category of the incumbent banks, this fact is

different, with a higher probability of this type of bank offering the PS than the digitalized or digital banks. These did not differ significantly in the insurance category (both have the letter “a”). It is also important to note that when one type of bank offers (or not) the full PS category, it is already statistically different from other types of banks.

We also plot the graphs to understand the differentiation of categories. Besides, when the confidence intervals do not overlap, the difference is considered significative (e.g., digital banks with the letters “c”, “b”, and “a”). When the intervals overlap in the graph, it is not possible to know if there is a statistical difference, which demands the analysis of the corresponding letters.

Figure 42 shows that in the category lending, for example, the digital banks have a low offer of PS. This offer is due the regulation, which does not allow digital banks to lend money in accounts of their clients.

Finally, Table 10 demonstrates the comparisons for the PS categories within each type of bank.

TABLE 10 - ODDS RATIO BETWEEN SERVICE CATEGORY FOR EACH BANK TYPE

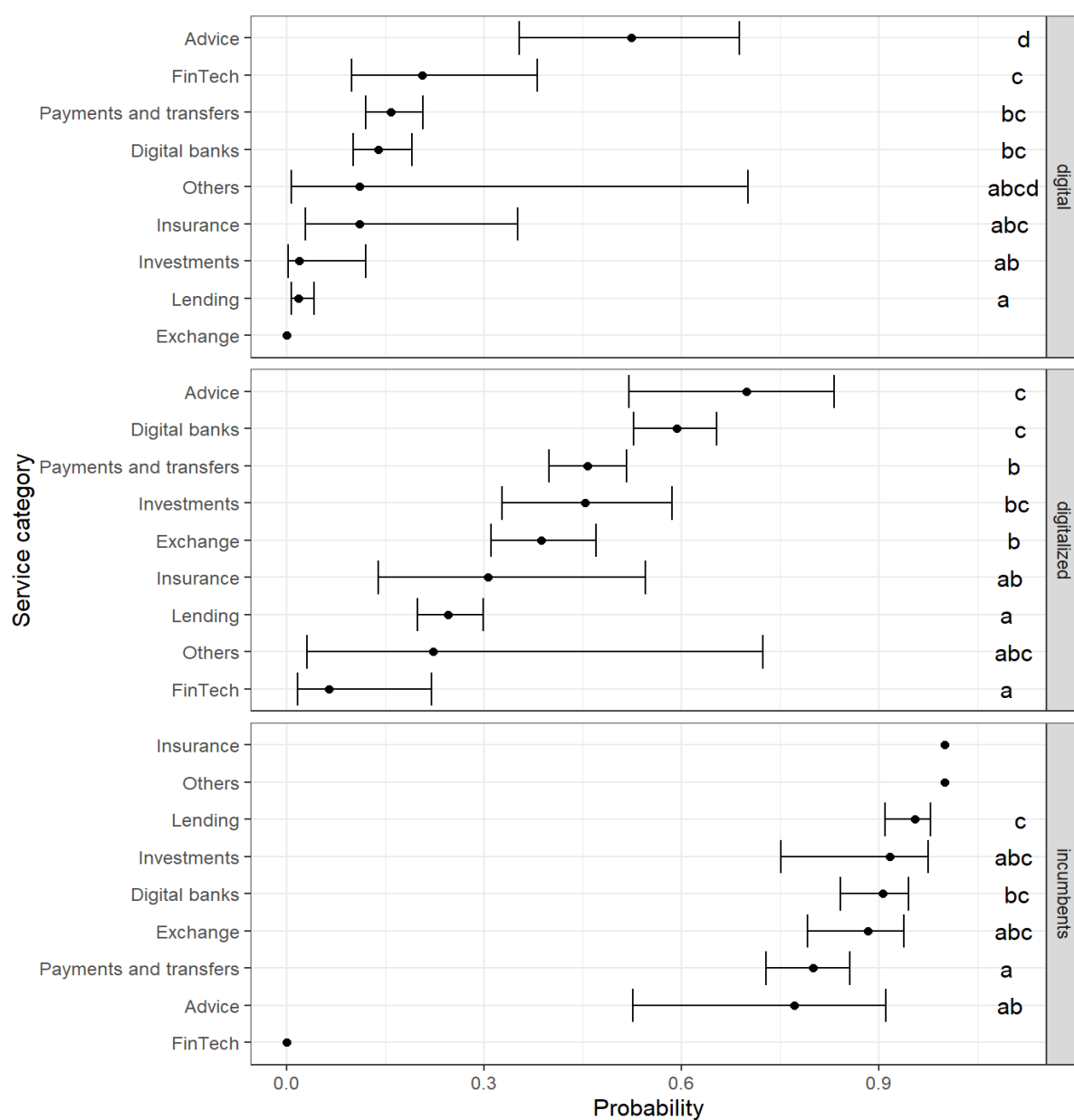
<i>Contrast</i>	FTCMA category	Odds.ratio	SE	Asymp.LCL	Asymp.UCL	p.value
<i>Digital</i>	Advice / Digital banks	6.7891	1.9416	2.7266	16.9044	<.0001
	Advice / Exchange					
	Advice / FinTech	4.2308	1.6953	1.1785	15.1883	0.0114
	Advice / Insurance	8.8000	5.1680	1.3519	57.2837	0.0076
	Advice / Investments	58.3000	44.1339	5.2116	652.1746	<.0001
	Advice / Lending	61.2700	24.9205	16.7417	224.2317	<.0001
	Advice / Others	8.8000	9.5942	0.2717	284.9743	0.817
	Advice / Payments and transfers	5.8414	1.6240	2.4064	14.1794	<.0001
	Digital banks / Exchange					
	Digital banks / FinTech	0.6232	0.2114	0.2112	1.8389	0.9984
	Digital banks / Insurance	1.2962	0.7093	0.2263	7.4248	1
	Digital banks / Investments	8.5873	6.2375	0.8465	87.1126	0.1049
	Digital banks / Lending	9.0248	3.1257	2.9899	27.2412	<.0001
	Digital banks / Others	1.2962	1.3859	0.0428	39.2482	1
	Digital banks / Payments and transfers	0.8604	0.1535	0.4871	1.5198	1
	Exchange / FinTech					
	Exchange / Insurance					
	Exchange / Investments					
	Exchange / Lending					
	Exchange / Others					
	Exchange / Payments and transfers					
	FinTech / Insurance	2.0800	1.2791	0.2925	14.7900	0.9999
	FinTech / Investments	13.7800	10.7303	1.1495	165.1853	0.0268
	FinTech / Lending	14.4820	6.4558	3.4937	60.0299	<.0001
	FinTech / Others	2.0800	2.2992	0.0612	70.6949	1
	FinTech / Payments and transfers	1.3807	0.4591	0.4780	3.9881	1
	Insurance / Investments	6.6250	5.8910	0.3885	112.9808	0.7064
	Insurance / Lending	6.9625	4.3091	0.9669	50.1348	0.06
	Insurance / Others	1.0000	1.1859	0.0228	43.9308	1
	Insurance / Payments and transfers	0.6638	0.3605	0.1174	3.7526	1
	Investments / Lending	1.0509	0.8216	0.0868	12.7241	1
	Investments / Others	0.1509	0.1930	0.0026	8.9096	0.9955
	Investments / Payments and transfers	0.1002	0.0725	0.0100	1.0064	0.0515
	Lending / Others	0.1436	0.1591	0.0042	4.9160	0.9499

<i>Contrast</i>	<i>FTCMA category</i>	<i>Odds.ratio</i>	<i>SE</i>	<i>Asymp.LCL</i>	<i>Asymp.UCL</i>	<i>p.value</i>
Digitalized	Lending / Payments and transfers	0.0953	0.0324	0.0323	0.2818	<.0001
	Others / Payments and transfers	0.6638	0.7083	0.0221	19.9647	1
	Advice / Digital banks	1.5921	0.4625	0.6303	4.0215	0.9846
	Advice / Exchange	3.6667	1.1028	1.4048	9.5706	0.0006
	Advice / FinTech	34.1579	19.9848	5.2843	220.7968	<.0001
	Advice / Insurance	5.2632	2.3904	1.2362	22.4082	0.0092
	Advice / Investments	2.7884	0.9362	0.9556	8.1367	0.0781
	Advice / Lending	7.1306	2.0776	2.8152	18.0613	<.0001
	Advice / Others	8.1053	6.8690	0.5429	120.9985	0.388
	Advice / Payments and transfers	2.7494	0.7907	1.0987	6.8805	0.0156
	Digital banks / Exchange	2.3030	0.3578	1.4031	3.7800	<.0001
	Digital banks / FinTech	21.4545	11.2707	4.0158	114.6209	<.0001
	Digital banks / Insurance	3.3058	1.2366	1.0025	10.9015	0.0489
	Digital banks / Investments	1.7514	0.3772	0.8811	3.4812	0.2847
	Digital banks / Lending	4.4787	0.6101	2.9004	6.9160	<.0001
	Digital banks / Others	5.0909	4.1104	0.3875	66.8773	0.8008
	Digital banks / Payments and transfers	1.7269	0.2209	1.1483	2.5970	0.0007
	Exchange / FinTech	9.3158	4.9475	1.7120	50.6922	0.001
	Exchange / Insurance	1.4354	0.5485	0.4242	4.8566	1
	Exchange / Investments	0.7605	0.1742	0.3662	1.5790	0.9999
	Exchange / Lending	1.9447	0.3053	1.1787	3.2085	0.0008
	Exchange / Others	2.2105	1.7931	0.1663	29.3891	1
	Exchange / Payments and transfers	0.7498	0.1123	0.4650	1.2093	0.8678
	FinTech / Insurance	0.1541	0.0972	0.0206	1.1523	0.1034
	FinTech / Investments	0.0816	0.0450	0.0140	0.4743	0.0002
	FinTech / Lending	0.2088	0.1098	0.0390	1.1170	0.0989
	FinTech / Others	0.2373	0.2263	0.0113	4.9732	0.9938
	FinTech / Payments and transfers	0.0805	0.0422	0.0151	0.4278	0.0001
	Insurance / Investments	0.5298	0.2173	0.1432	1.9605	0.9906
	Insurance / Lending	1.3548	0.5077	0.4100	4.4774	1
	Insurance / Others	1.5400	1.3546	0.0931	25.4736	1
	Insurance / Payments and transfers	0.5224	0.1942	0.1596	1.7103	0.9517
	Investments / Lending	2.5572	0.5537	1.2818	5.1020	0.0005
	Investments / Others	2.9068	2.3974	0.2094	40.3593	0.9996
	Investments / Payments and transfers	0.9860	0.2085	0.5024	1.9354	1
	Lending / Others	1.1367	0.9181	0.0864	14.9471	1
	Lending / Payments and transfers	0.3856	0.0501	0.2548	0.5835	<.0001
	Others / Payments and transfers	0.3392	0.2735	0.0259	4.4413	0.9992
Incumbents	Advice / Digital banks	0.3506	0.1599	0.0819	1.5022	0.5441
	Advice / Exchange	0.4434	0.2103	0.0977	2.0127	0.9613
	Advice / FinTech					
	Advice / Insurance					
	Advice / Investments	0.3068	0.1892	0.0429	2.1932	0.8713
	Advice / Lending	0.1570	0.0764	0.0332	0.7412	0.0051
	Advice / Others					
	Advice / Payments and transfers	0.8438	0.3605	0.2160	3.2966	1
	Digital banks / Exchange	1.2646	0.4172	0.4415	3.6224	1
	Digital banks / FinTech					
	Digital banks / Insurance					
	Digital banks / Investments	0.8750	0.4497	0.1698	4.5085	1
	Digital banks / Lending	0.4477	0.1556	0.1478	1.3562	0.5296
	Digital banks / Others					
	Digital banks / Payments and transfers	2.4062	0.6205	1.0572	5.4770	0.0235
	Exchange / FinTech					
	Exchange / Insurance					
	Exchange / Investments	0.6919	0.3668	0.1275	3.7536	1
	Exchange / Lending	0.3540	0.1313	0.1084	1.1558	0.1687
	Exchange / Others					
	Exchange / Payments and transfers	1.9028	0.5493	0.7576	4.7788	0.6106
	FinTech / Insurance					
	FinTech / Investments					
	FinTech / Lending					
	FinTech / Others					

Contrast	FTCMA category	Odds.ratio	SE	Asymp.LCL	Asymp.UCL	p.value
	FinTech / Payments and transfers					
	Insurance / Investments					
	Insurance / Lending					
	Insurance / Others					
	Insurance / Payments and transfers					
	Investments / Lending	0.5116	0.2769	0.0910	2.8756	0.9998
	Investments / Others					
	Investments / Payments and transfers	2.7500	1.3435	0.5788	13.0651	0.7557
	Lending / Others					
	Lending / Payments and transfers	5.3750	1.6588	2.0084	14.3848	<.0001
	Others / Payments and transfers					

SOURCE: The Author (2020)

FIGURE 43 - MARGINAL PROBABILITY ESTIMATED BY THE MODEL OF EACH TYPE OF BANK TO OFFER A GIVEN CATEGORY OF PRODUCT AND SERVICE



SOURCE: The Author (2020)

The differences that are clearly presented in Figure 40 (descriptive) are presented here. For example, for a digital bank, the chance to offer a PS from the category Advice is 61.27 times that of offering a PS from the category Lending. In other words, for digital banks: the chance (that is, the Odds Ratio) of these banks to offer a PS of the category Payments and transfers is higher than of offering a PS of the category Lending (intervals do not overlap);

Visibly, there is no way for us to know if the chance of these banks offering a PS from the Investments category is more significant than offering a PS from the Digital banks category (the ranges overlap). In Table 10, we obtained a p-value = 0.1049, so the categories do not differ. We also have no way of visibly knowing if the chance of digital banks offering a PS in the Fintech category is greater than offering a PS in the Investments category (the ranges overlap). However, in the table, we have a p-value = 0.0268, so the categories differ.

6.2.1.2 Oliveira; von Hippel I (2011) – no transactions, transactions, and channel

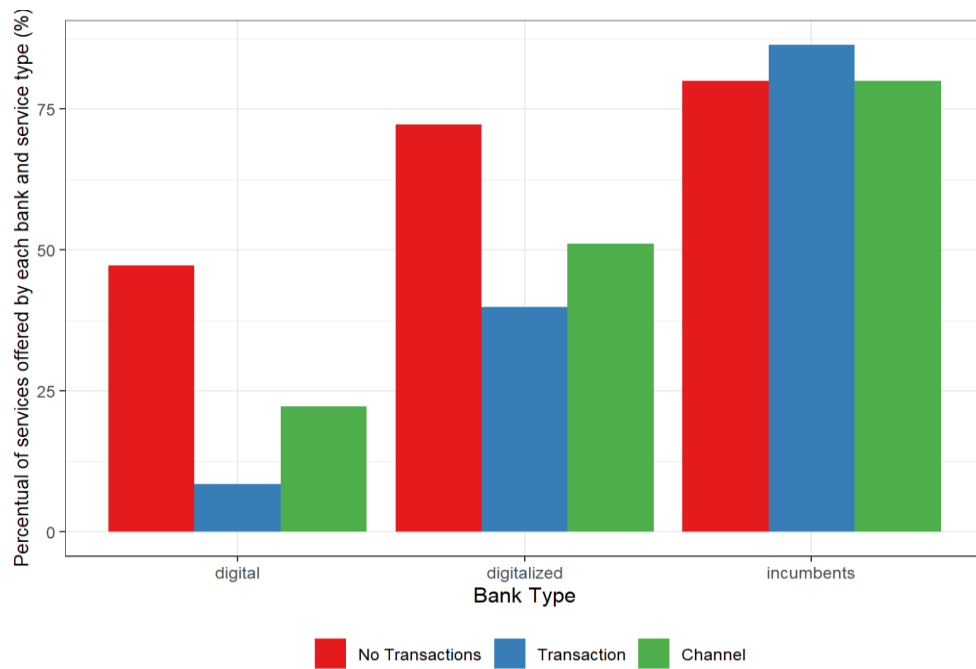
As we explain in Figure 36, the first classification of Oliveira; von Hippel (2011) divides the PS into three categories. Fewer categories facilitate to visualize and interpret the results. Table 11 shows that, in the descriptive analysis of this categorization, no service is offered (or not) in its entirety (percentage = 0 or 100%).

TABLE 11 - DESCRIPTIVE ANALYSIS AND DATA USED BY MODEL

Type of bank	Category by Oliveira; von Hippel I (2011)	Total	Offered	Percentage	Not offered
Digital	No Transactions	72	34	47.22	38
Digital	Transaction	2016	170	8.43	1846
Digital	Channel	45	10	22.22	35
Digitalized	No Transactions	72	52	72.22	20
Digitalized	Transaction	2016	805	39.93	1211
Digitalized	Channel	45	23	51.11	22
Incumbents	No Transactions	40	32	80.00	8
Incumbents	Transaction	1120	968	86.43	152
Incumbents	Channel	25	20	80.00	5

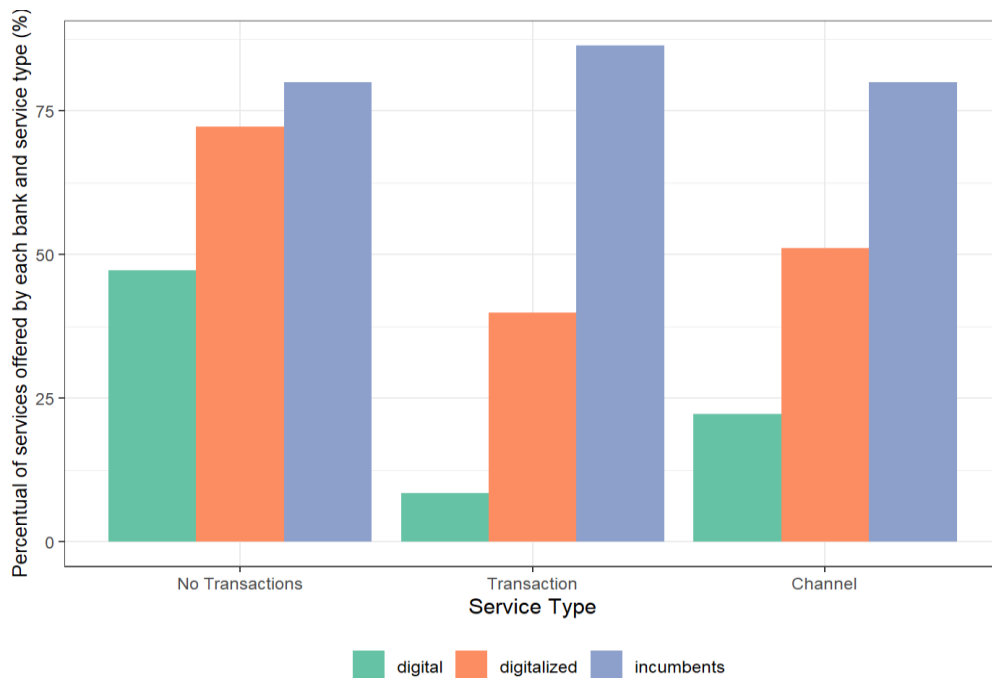
SOURCE: The Author (2020)

FIGURE 44 – PERCENTUAL OF PRODUCT AND SERVICE OFFERED BY EACH TYPE OF BANK ACCORDING OLIVEIRA; VON HIPPEL I (2011)



SOURCE: The Author (2020)

FIGURE 45 - PERCENTUAL OF PRODUCT AND SERVICE TYPE OFFERED BY EACH TYPE OF BANK ACCORDING OLIVEIRA; VON HIPPEL I (2011)



SOURCE: The Author (2020)

The five largest banks are large concerning the other categories, generally older, and framed as full-service banks. Thus, as they offer a broad portfolio of PS (as

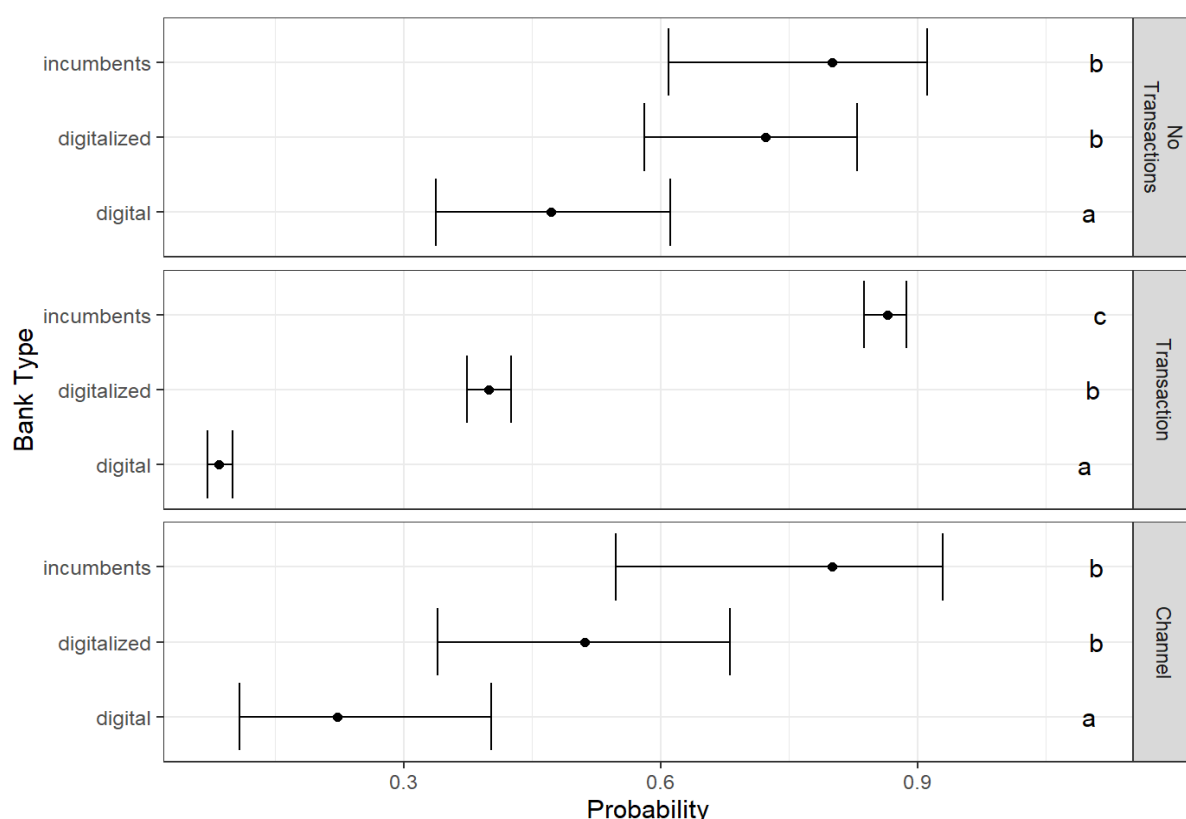
seen in the analysis of Table 7) the data also reflect these characteristics of the incumbent type institutions. In this specific case, changes occur only in the distribution in terms of PS categories. When fitting the model, the interaction is significant. Table 12, Figure 46, and Figure 47 summarize the model.

TABLE 12 - ESTIMATED MARGINAL PROBABILITY FOR EACH BANK TYPE AND CATEGORY OF SERVICE

<i>Type of bank</i>	<i>Category by Oliveira; von Hippel I (2011)</i>	<i>Prob.</i>	<i>SE</i>	<i>asympt.LCL</i>	<i>asympt.UCL</i>
digital	No Transactions	0.4722	0.0588	0.3374	0.6112
digitalized	No Transactions	0.7222	0.0528	0.5811	0.8297
incumbents	No Transactions	0.8000	0.0632	0.6088	0.9113
digital	Transaction	0.0843	0.0062	0.0707	0.1003
digitalized	Transaction	0.3993	0.0109	0.3736	0.4256
incumbents	Transaction	0.8643	0.0102	0.8379	0.8869
digital	Channel	0.2222	0.0620	0.1082	0.4021
digitalized	Channel	0.5111	0.0745	0.3390	0.6806
incumbents	Channel	0.8000	0.0800	0.5480	0.9296

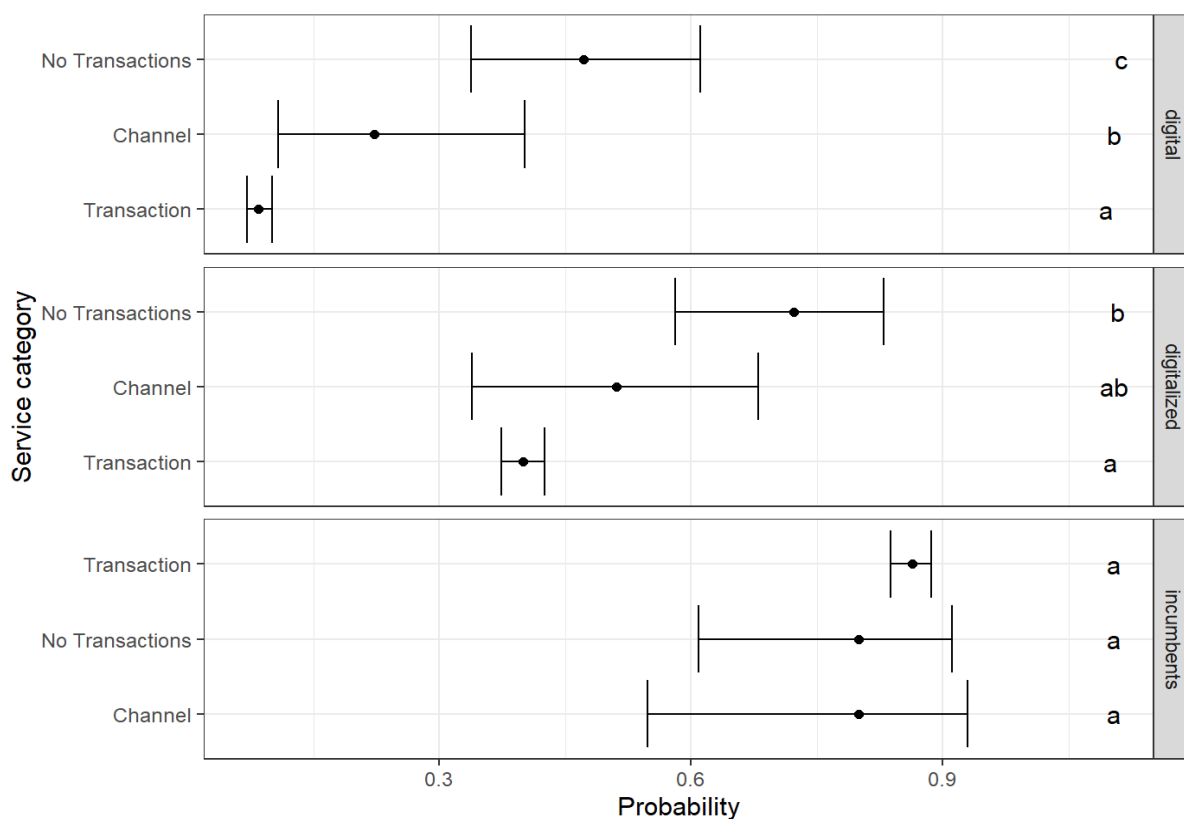
SOURCE: The Author (2020)

FIGURE 46 - ESTIMATED MARGINAL PROBABILITY FOR EACH CATEGORY OF SERVICE



SOURCE: The Author (2020)

FIGURE 47 - ESTIMATED MARGINAL PROBABILITY FOR EACH TYPE OF BANK



SOURCE: The Author (2020)

Among the categories “No Transactions” and “Channel”, the incumbents and the digitalized ones had the same proportion of offer, a more significant proportion than the digital banks. For the “transaction” category, the incumbents offered more than the digitalized banks, which in turn offered more than the digital ones.

Regarding the three types of banks, among the digital ones, the offer was higher in the category “no transactions” than in the “channel”, which in turn was higher than “transaction”. In the digitalized banks, the “no transaction” category was larger than the “transaction” category. In the incumbents, the proportion of offer was equal among the three categories of PS in this type of analysis.

6.2.1.3 Oliveira; von Hippel II (2011) – core or adjacent products and services

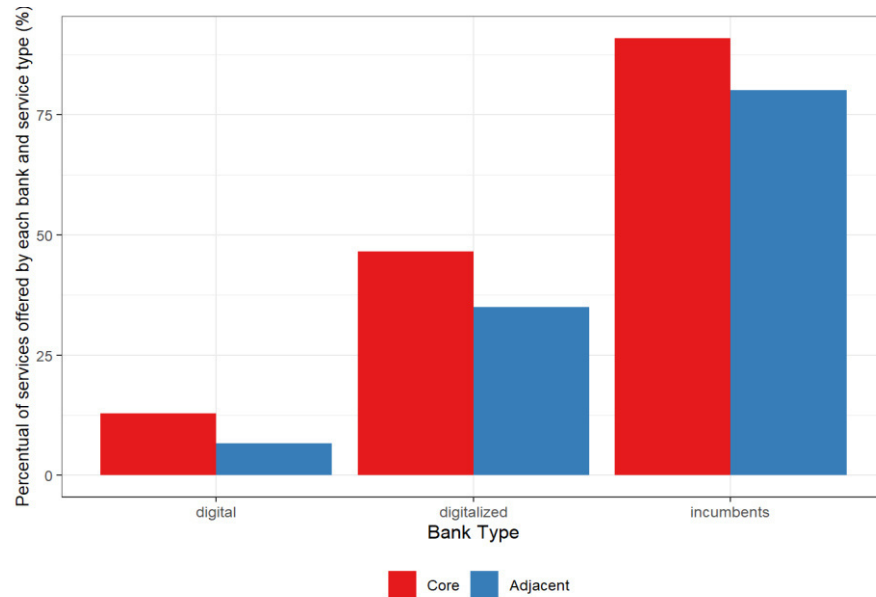
As described in Figure 37, Oliveira; von Hippel (2011) categorize banking PS in “core” and “adjacent”. Table 13, Figure 48, and Figure 49 show a previous analysis of the and data analyzed by the model.

TABLE 13 - DESCRIPTIVE ANALYSIS AND DATA ANALYZED BY THE MODEL

Type	Category	Total	Offered	Percentage	Not offered
Digital	Core	1161	149	12.83	1012
Digital	Adjacent	972	65	6.69	907
Digitalized	Core	1161	540	46.51	621
Digitalized	Adjacent	972	340	34.98	632
Incumbents	Core	645	587	91.01	58
Incumbents	Adjacent	540	433	80.19	107

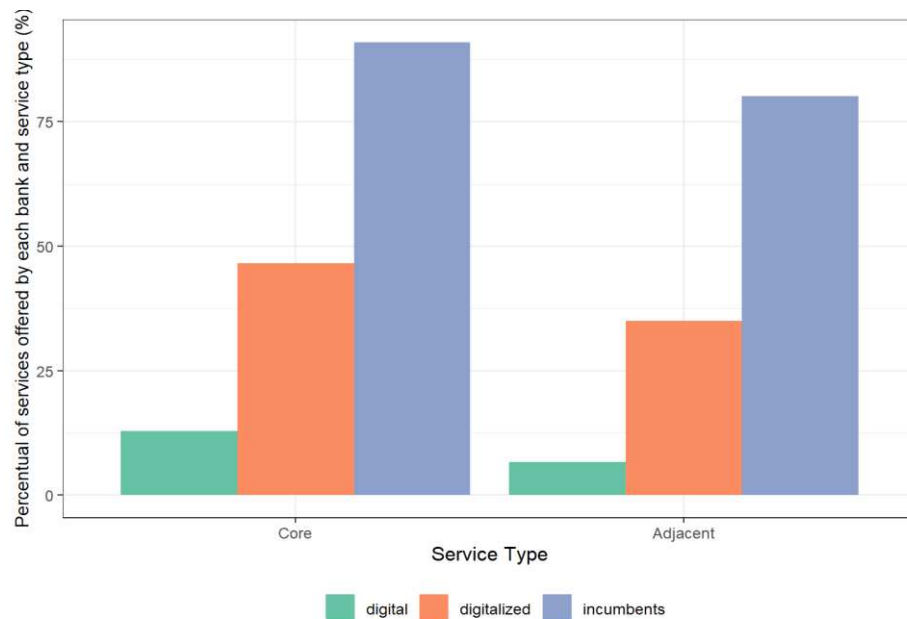
SOURCE: The Author (2020)

FIGURE 48 - DESCRIPTIVE ANALYSIS BY BANK TYPE ACCORDING TO OLIVEIRA; VON HIPPEL II (2011)



SOURCE: The Author (2020)

FIGURE 49 - DESCRIPTIVE ANALYSIS BY EACH CATEGORY OF OLIVEIRA; VON HIPPEL II (2011)



SOURCE: The Author (2020)

For this categorization, we find that the offer of a core service was higher in relation to adjacent, regardless of the type of bank. Therefore, the interaction was not significant in the model (that is, the offer is independent of the type of PS and bank). The results of the model are as follows, illustrated in Table 14, Table 15, Table 16, Table 17, Figure 50, and Figure 51.

TABLE 14 - ESTIMATED MARGINAL PROBABILITY FOR EACH PRODUCT AND SERVICE CATEGORY

Category	prob	SE	asympt.LCL	asympt.UCL
Adjacent	0.3603	0.0129	0.3319	0.3896
Core	0.5074	0.0127	0.4791	0.5357

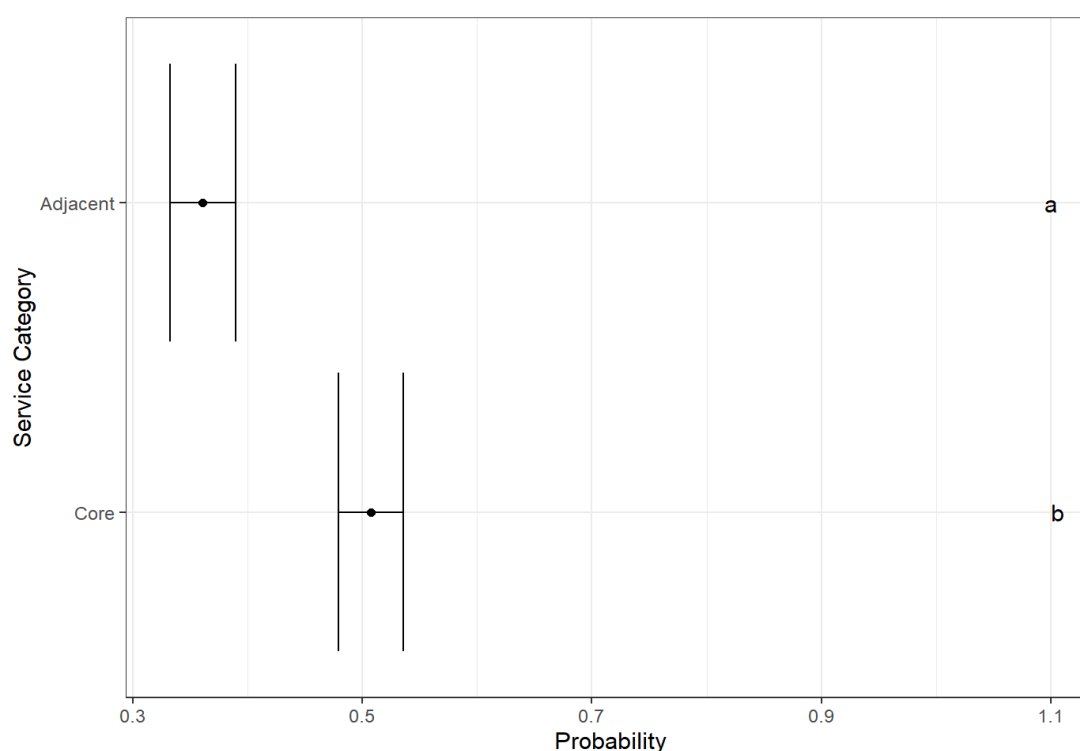
SOURCE: The Author (2020)

TABLE 15 - ODDS RATIO BETWEEN SERVICE CATEGORIES

Contrast	odds.ratio	SE	asympt.LCL	asympt.UCL	p.value
Core / Adjacent	1.8294	0.129	1.5933	2.1005	<.0001

SOURCE: The Author (2020)

FIGURE 50 - ESTIMATED MARGINAL PROBABILITY FOR EACH PRODUCT AND SERVICE CATEGORY



SOURCE: The Author (2020)

TABLE 16 - ESTIMATED MARGINAL PROBABILITY FOR EACH BANK TYPE

Type	prob	SE	asympt.LCL	asympt.UCL
Digital	0.0948	0.0063	0.0809	0.1110
Digitalized	0.4041	0.0108	0.3786	0.4301
Incumbents	0.8615	0.0101	0.8356	0.8838

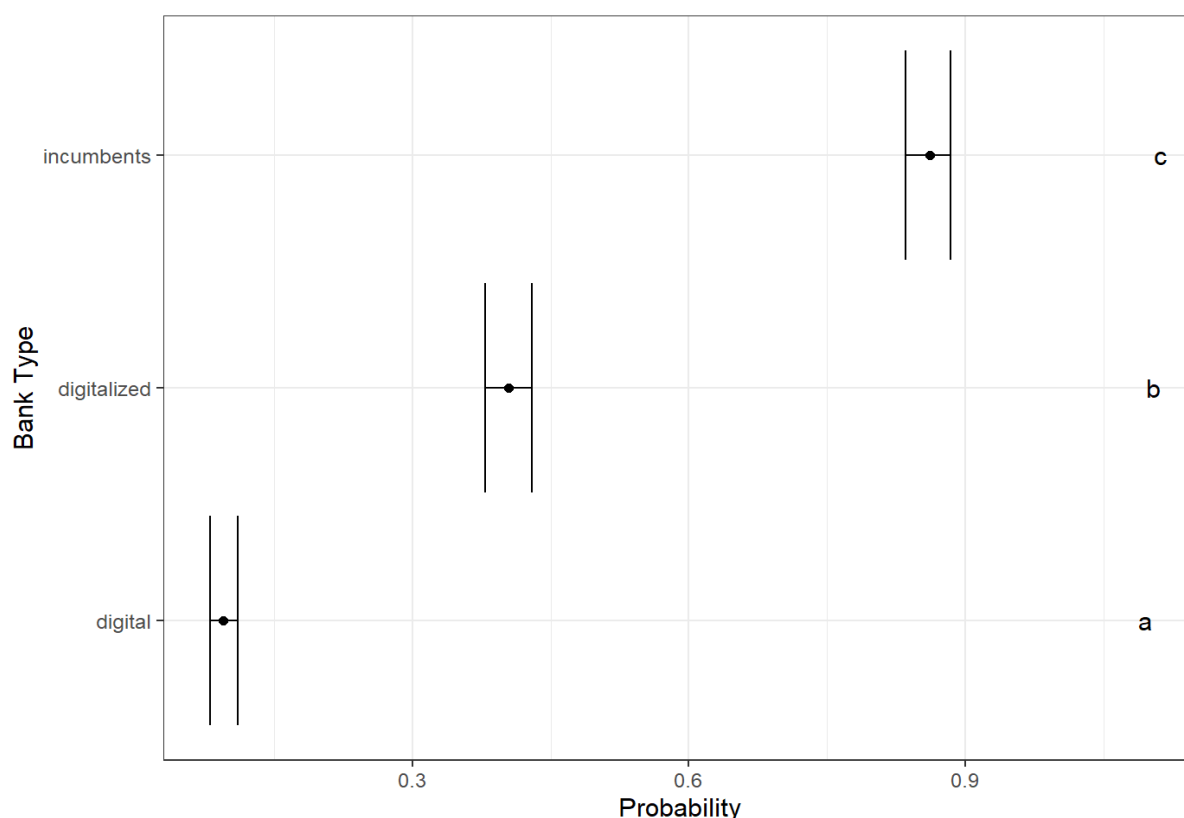
SOURCE: The Author (2020)

TABLE 17 - ODDS RATIO BETWEEN BANK TYPES

Contrast	odds.ratio	SE	asympt.LCL	asympt.UCL	p.value
Digital / digitalized	0.1545	0.0132	0.1261	0.1894	<.0001
Digital / incumbents	0.0168	0.0019	0.0129	0.0220	<.0001
Digitalized / incumbents	0.1090	0.0105	0.0867	0.1371	<.0001

SOURCE: The Author (2020)

FIGURE 51 - ESTIMATED MARGINAL PROBABILITY FOR EACH BANK TYPE



SOURCE: The Author (2020)

The three types of banks offer more PS from the core category than the adjacent. As in previous analyses, the incumbent banks offer more PS than the others (the same result as the other analyses).

As the interaction of the model is not significative, it is not necessary to stratify the table, which facilitates the interpretation. Regardless of the type of bank, the probability of offering a core service is 0.5074. All banks have the same probability of offering a core (or even an adjacent) service.

6.2.1.4 Barbosa; de Paula Rocha; Salazar (2015) – classic bank, other financial bank, and other non-financial products and services

The categorization of Barbosa; de Paula Rocha; Salazar (2015) divides the PS into three types: classic bank products, other bank products, and other non-financial

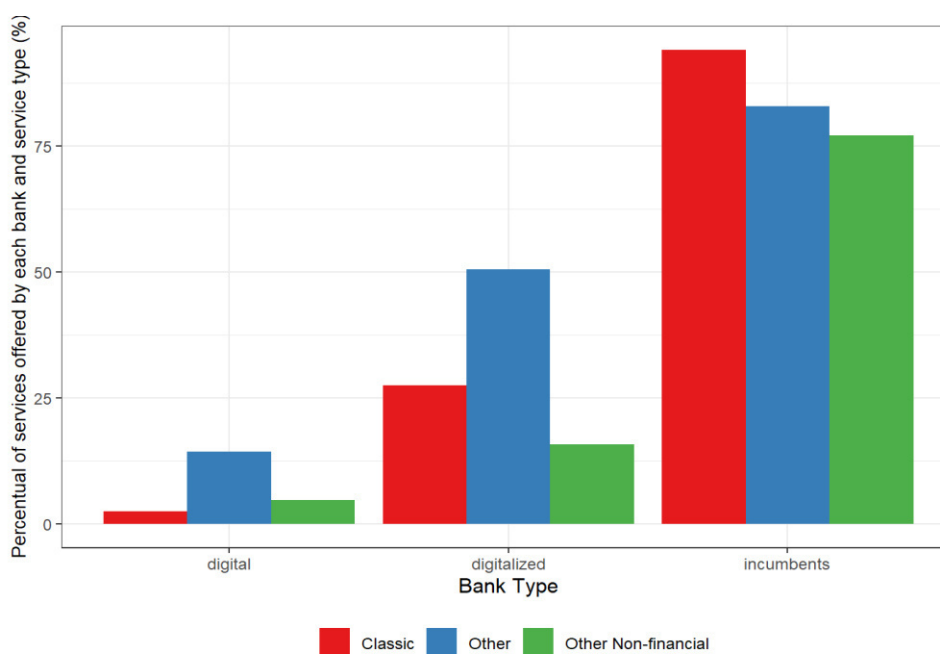
banking products. We verify that other non-financial banking products is more represented in incumbent banks type.

TABLE 18 - DESCRIPTIVE ANALYSIS AND DATA USED BY MODEL

Type	Category	Total	Offered	Perc.	Not offered
Digital	Classic	675	17	2.52	658
Digital	Other	1332	191	14.34	1141
Digital	Other Non-financial	126	6	4.76	120
Digitalized	Classic	675	186	27.56	489
Digitalized	Other	1332	674	50.60	658
Digitalized	Other Non-financial	126	20	15.87	106
Incumbents	Classic	375	353	94.13	22
Incumbents	Other	740	613	82.84	127
Incumbents	Other Non-financial	70	54	77.14	16

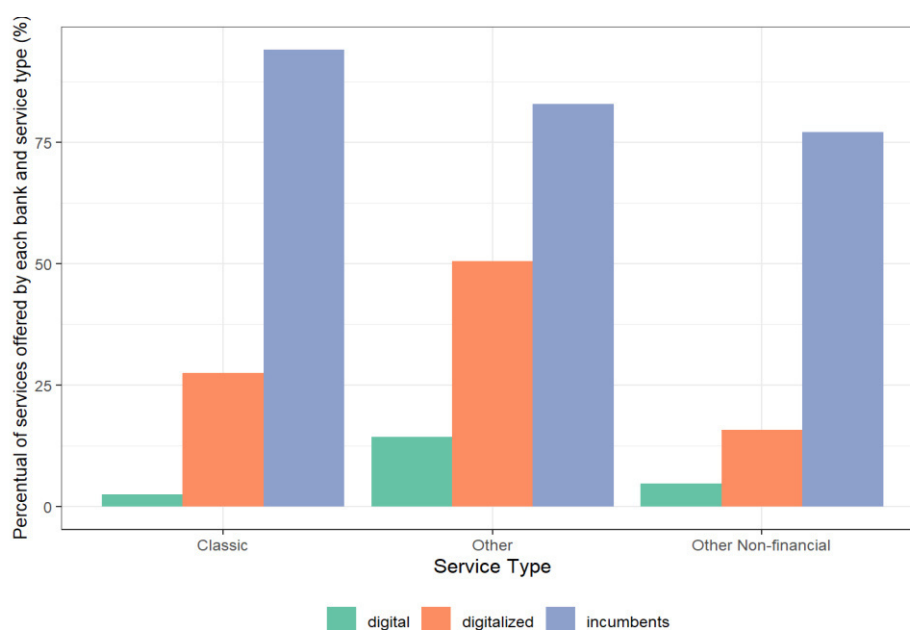
SOURCE: The Author (2020)

FIGURE 52 – CATEGORIZATION ACCORDING TO EACH BANK TYPE



SOURCE: The Author (2020)

FIGURE 53 - CATEGORIZATION ACCORDING TO EACH TYPE OF PS



SOURCE: The Author (2020)

The interaction in the model was significant, according to the results of Table 19.

TABLE 19 - ESTIMATED MARGINAL PROBABILITY FOR EACH PS CATEGORY AND BANK TYPE

Type	Category	Prob.	SE	asympt.LCL	asympt.UCL
digital	Classic	0.0252	0.0060	0.0142	0.0444
digitalized	Classic	0.2756	0.0172	0.2364	0.3184
incumbents	Classic	0.9413	0.0121	0.9047	0.9644
digital	Other	0.1434	0.0096	0.1220	0.1679
digitalized	Other	0.5060	0.0137	0.4733	0.5386
incumbents	Other	0.8284	0.0139	0.7927	0.8590
digital	Other Non-financial	0.0476	0.0190	0.0181	0.1195
digitalized	Other Non-financial	0.1587	0.0326	0.0954	0.2524
incumbents	Other Non-financial	0.7714	0.0502	0.6311	0.8694

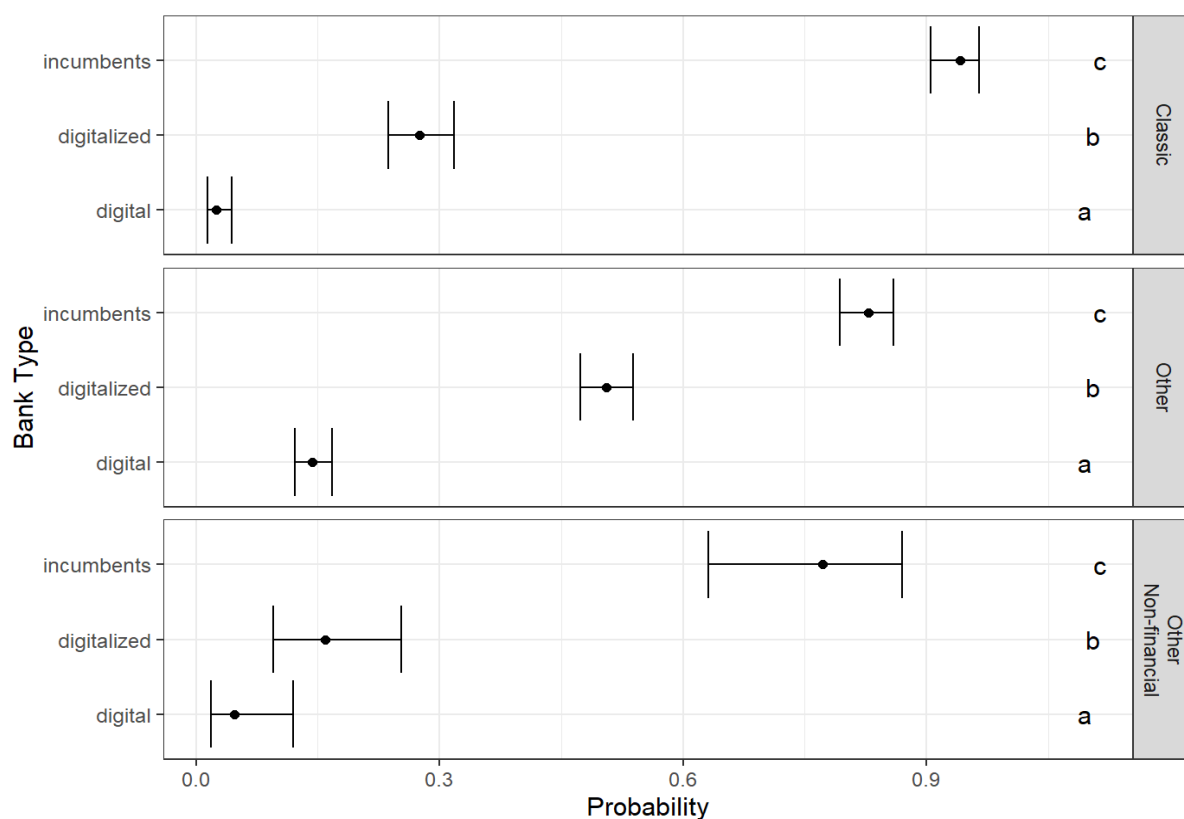
SOURCE: The Author (2020)

TABLE 20 - ODDS RATIO BETWEEN EACH SERVICE CATEGORY AND BANK TYPE

Category	Bank type	Odds.Ratio	SE	asympt.LCL	asympt.UCL	p.value
Classic	Digital / digitalized	0.0679	0.0177	0.0365	0.1265	<.0001
	Digital / incumbents	0.0016	0.0005	0.0007	0.0035	<.0001
	Digitalized / incumbents	0.0237	0.0056	0.0135	0.0416	<.0001
Other	Digital / digitalized	0.1634	0.0156	0.1301	0.2053	<.0001
	Digital / incumbents	0.0347	0.0043	0.0257	0.0467	<.0001
	Digitalized / incumbents	0.2122	0.0237	0.1625	0.2772	<.0001
Other Non-financial	Digital / digitalized	0.2650	0.1283	0.0834	0.8420	0.0182
	Digital / incumbents	0.0148	0.0075	0.0044	0.0496	<.0001
	Digitalized / incumbents	0.0559	0.0210	0.0228	0.1368	<.0001

SOURCE: The Author (2020)

FIGURE 54 - ESTIMATED MARGINAL PROBABILITY FOR EACH PS CATEGORY AND BANK TYPE



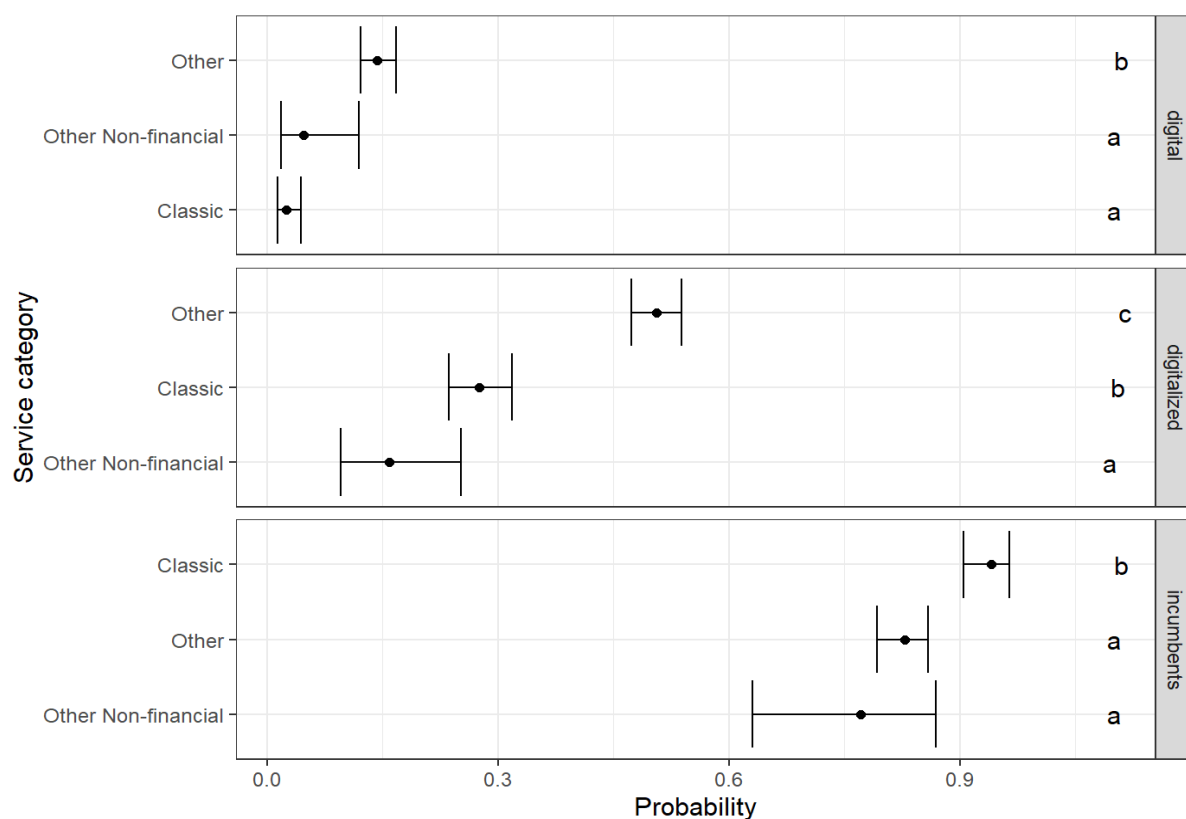
SOURCE: The Author (2020)

TABLE 21 - ODDS RATIO BETWEEN BANK TYPE AND SERVICE CATEGORY

Contrast	Service category	odds.ratio	SE	asympt.LCL	asympt.UCL	p.value
Digital	Classic / Other	0.1543	0.0398	0.0834	0.2856	<.0001
	Classic / (Other Non-financial)	0.5167	0.2507	0.1623	1.6456	0.4354
	Other / (Other Non-financial)	3.3479	1.4248	1.2119	9.2489	0.0135
Digitalized	Classic / Other	0.3713	0.0379	0.2910	0.4739	<.0001
	Classic / (Other Non-financial)	2.0160	0.5213	1.0873	3.7377	0.02
	Other / (Other Non-financial)	5.4289	1.3565	2.9895	9.8588	<.0001
Incumbents	Classic / Other	3.3243	0.7992	1.8724	5.9018	<.0001
	Classic / (Other Non-financial)	4.7542	1.7096	2.0146	11.2194	<.0001
	Other / (Other Non-financial)	1.4302	0.4303	0.6972	2.9335	0.5512

SOURCE: The Author (2020)

FIGURE 55 - ESTIMATED MARGINAL PROBABILITY FOR EACH TYPE OF BANK AND PS CATEGORY



SOURCE: The Author (2020)

For each type of service, all comparisons between the types of banks are significant. For incumbent and digital banks, there was no significant difference between other bank products and other non-financial banking products.

6.2.2 Analysis 2 - Comparison of the fees price of the products and services for each type of bank

In this analysis, we changed the interpretation in relation to the previous ones. We focus on evaluating if the products are charged or not for each PS category instead of analyzing the PS in terms of availability (as in previous analyses).

6.2.2.1 FTCMA categorization

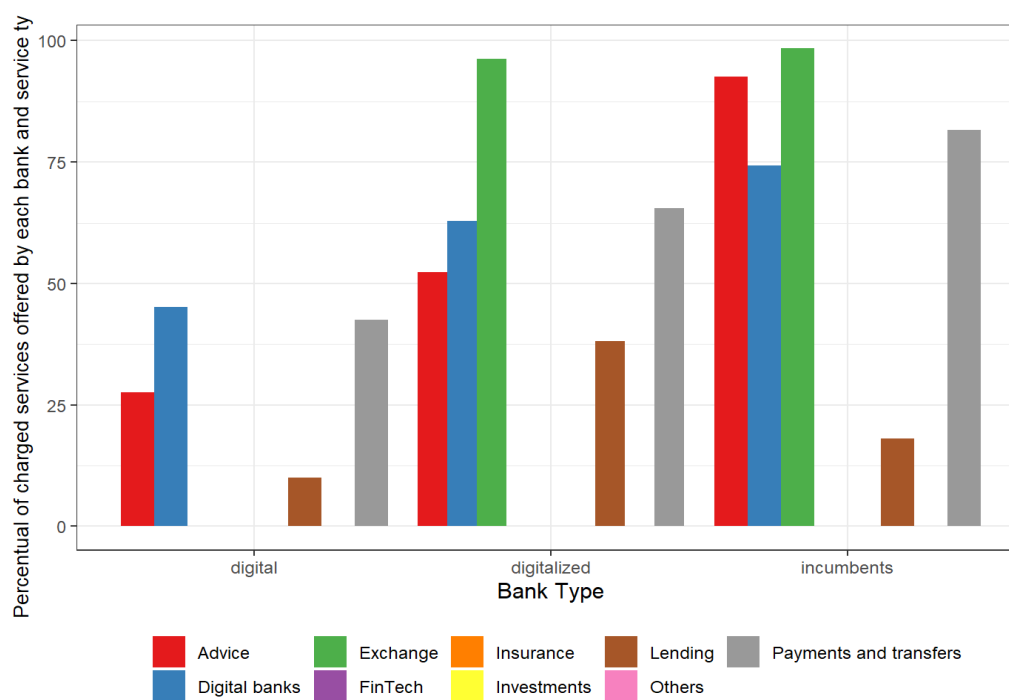
Table 22, Figure 56, and Figure 57 show the descriptive results of the analysis according to FTCMA categorization.

TABLE 22 - DESCRIPTIVE ANALYSIS AND DATA USED BY MODEL

Type	Category	Offered	Charged	Perc	Not charged
Digital	Advice	29	8	27.59	21
Digital	Digital banks	62	28	45.16	34
Digital	FinTech	13	0	0.00	13
Digital	Insurance	4	0	0.00	4
Digital	Investments	2	0	0.00	2
Digital	Lending	10	1	10.00	9
Digital	Others	1	0	0.00	1
Digital	Payments and transfers	87	37	42.53	50
Digitalized	Advice	44	23	52.27	21
Digitalized	Digital banks	269	169	62.83	100
Digitalized	Exchange	108	104	96.30	4
Digitalized	FinTech	4	0	0.00	4
Digitalized	Insurance	11	0	0.00	11
Digitalized	Investments	49	0	0.00	49
Digitalized	Lending	139	53	38.13	86
Digitalized	Others	2	0	0.00	2
Digitalized	Payments and transfers	249	163	65.46	86
Incumbents	Advice	27	25	92.59	2
Incumbents	Digital banks	222	165	74.32	57
Incumbents	Exchange	124	122	98.39	2
Incumbents	Insurance	20	0	0.00	20
Incumbents	Investments	55	0	0.00	55
Incumbents	Lending	298	54	18.12	244
Incumbents	Others	5	0	0.00	5
Incumbents	Payments and transfers	228	186	81.58	42

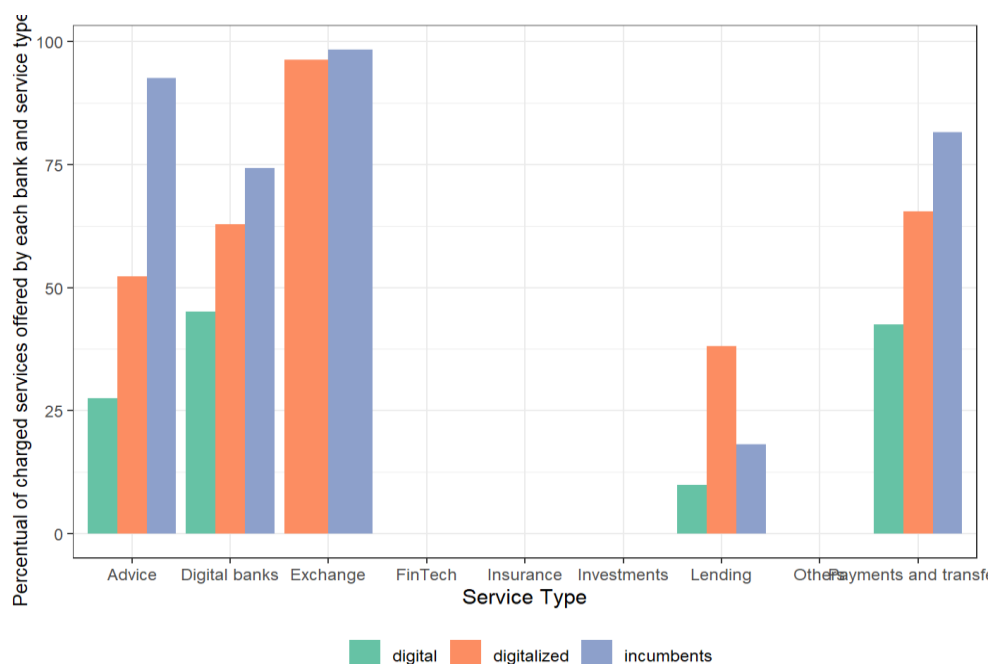
SOURCE: The Author (2020)

FIGURE 56 - DESCRIPTIVE ANALYSIS AND DATA USED BY MODEL ACCORDING TO EACH TYPE OF BANK



SOURCE: The Author (2020)

FIGURE 57 - DESCRIPTIVE ANALYSIS AND DATA USED BY MODEL ACCORDING TO FTCMA



SOURCE: The Author (2020)

The Total column refers to the number of services offered. It should have the same amount of which we present in Table 7 in the Frequency column. However, it is not the same since 52 services are classified as “M”. So, as they do not describe the amount charged, they are discarded. However, we observed that the quantities are still close.

Moreover, the PS of the categories FinTech, insurance, investments, and others have their characteristics of collection that are not the focus of this work (e.g., comparisons of insurance prices or investment management fees). However, we kept their values zero in order not to exclude them from the analysis. We have verified that, in most cases, the digital banks are the ones that least charge all the types of PS analyzed. The interaction of the model is significative, and we present the results in Table 25, Table 23, Table 24, Figure 58, and Figure 59.

TABLE 23 - ESTIMATED MARGINAL PROBABILITY FOR EACH SERVICE CATEGORY AND BANK TYPE

Type	Category	Prob.	SE	asympt.LCL	asympt.UCL
Digital	Advice	0.2759	0.0830	0.1238	0.5067
Digitalized	Advice	0.5227	0.0753	0.3476	0.6925
Incumbents	Advice	0.9259	0.0504	0.6838	0.9864
Digital	Digital banks	0.4516	0.0632	0.3093	0.6023
Digitalized	Digital banks	0.6283	0.0295	0.5556	0.6955
Incumbents	Digital banks	0.7432	0.0293	0.6673	0.8069
Digital	Exchange	0.0000			
Digitalized	Exchange	0.9630	0.0182	0.8851	0.9887
Incumbents	Exchange	0.9839	0.0113	0.9175	0.9970
Digital	Lending	0.1000	0.0949	0.0089	0.5792
Digitalized	Lending	0.3813	0.0412	0.2888	0.4832
Incumbents	Lending	0.1812	0.0223	0.1339	0.2407
Digital	Payments and transfers	0.4253	0.0530	0.3060	0.5540
Digitalized	Payments and transfers	0.6546	0.0301	0.5796	0.7226
Incumbents	Payments and transfers	0.8158	0.0257	0.7465	0.8694

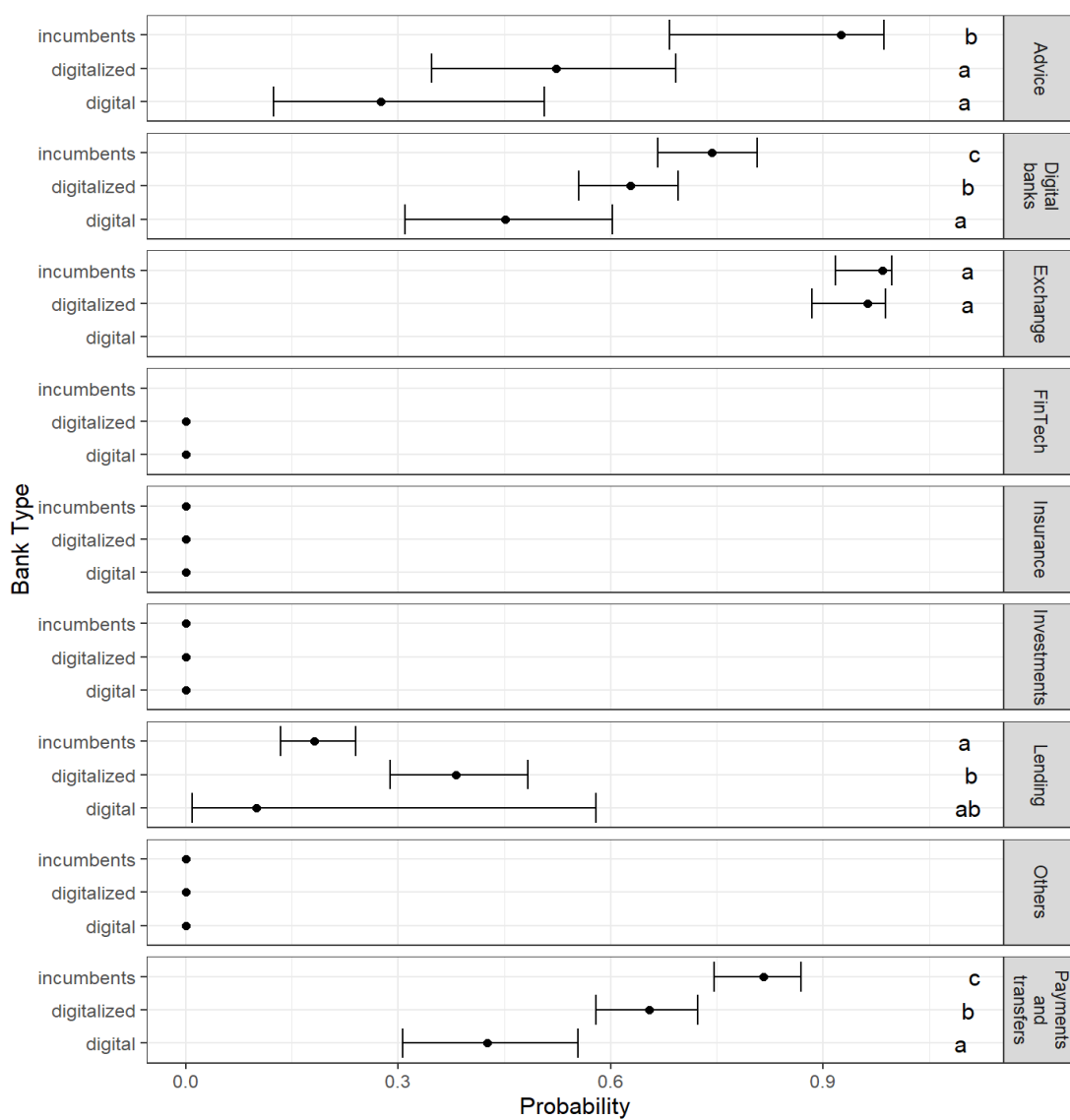
SOURCE: The Author (2020)

TABLE 24 - ODDS RATIO BETWEEN BANK TYPE FOR EACH SERVICE CATEGORY

contrast	bank type	odds.ratio	SE	asympt.LCL	asympt.UCL	p.value
Advice	digital / digitalized	0.3478	0.1786	0.1021	1.1855	0.1145
	digital / incumbents	0.0305	0.0257	0.0041	0.2287	0.0001
	digitalized / incumbents	0.0876	0.0696	0.0131	0.5840	0.0065
Digital banks	digital / digitalized	0.4873	0.1387	0.2469	0.9616	0.0343
	digital / incumbents	0.2845	0.0847	0.1397	0.5794	0.0001
	digitalized / incumbents	0.5838	0.1161	0.3632	0.9385	0.0202
Exchange	digital / digitalized					
	digital / incumbents					
	digitalized / incumbents	0.4262	0.3735	0.0526	3.4538	0.6998
Lending	digital / digitalized	0.1803	0.1926	0.0141	2.3118	0.2923
	digital / incumbents	0.5021	0.5346	0.0395	6.3811	0.8877
	digitalized / incumbents	2.7847	0.6418	1.6062	4.8279	<.0001
Payments and transfers	digital / digitalized	0.3904	0.0994	0.2126	0.7170	0.0007
	digital / incumbents	0.1671	0.0461	0.0864	0.3230	<.0001
	digitalized / incumbents	0.4280	0.0927	0.2551	0.7180	0.0003

SOURCE: The Author (2020)

FIGURE 58 - ESTIMATED MARGINAL PROBABILITY FOR EACH PS CATEGORY AND BANK TYPE



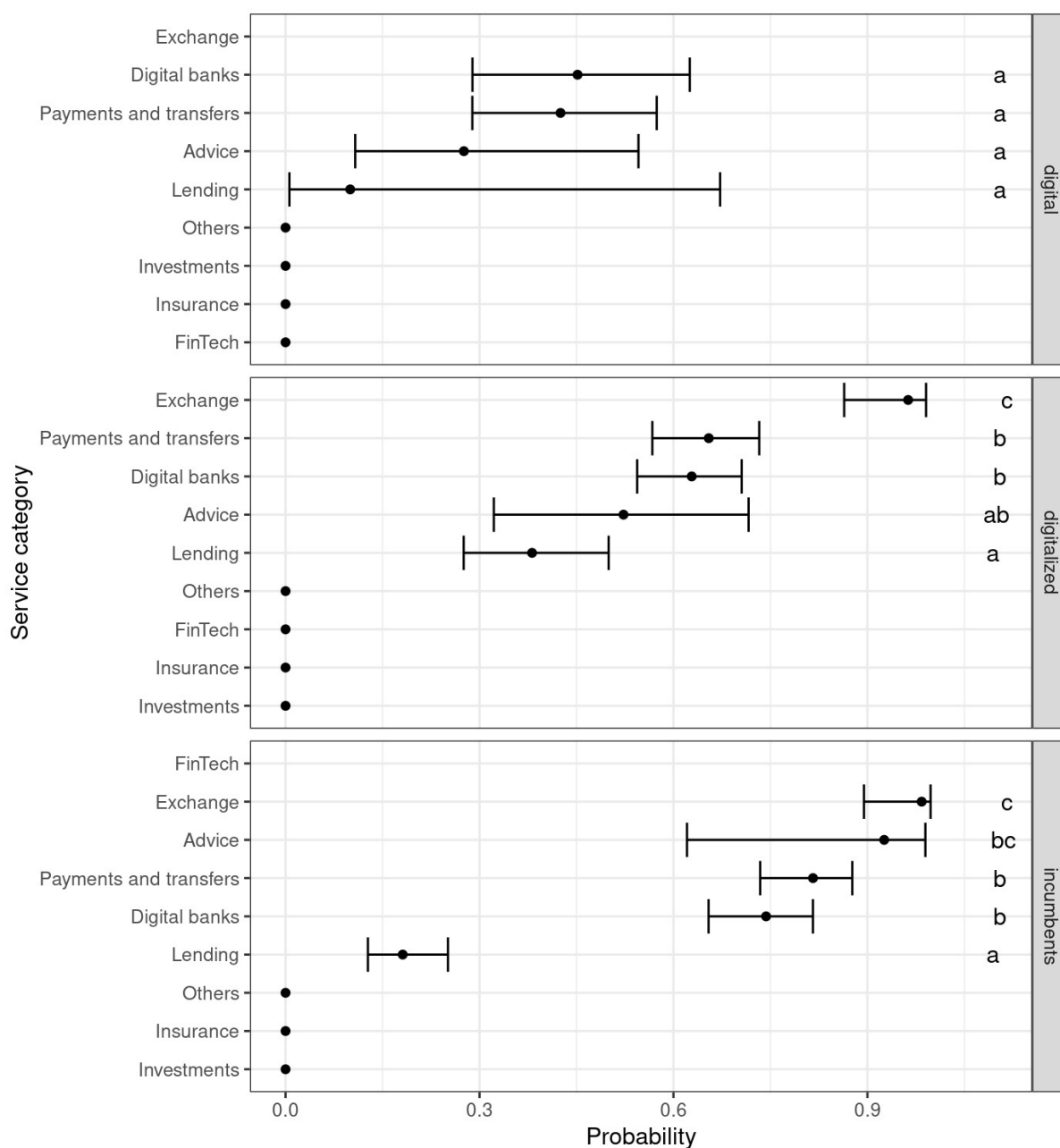
SOURCE: The Author (2020)

TABLE 25 – ODDS RATIO BETWEEN SERVICE CATEGORY FOR EACH BANK TYPE

Contrast	Service category	odds.ratio	SE	asympt.LCL	asympt.UCL	p.value
Digital	Advice / Digital banks	0.4626	0.2256	0.1181	1.8115	0.7014
	Advice / Exchange					
	Advice / Lending	3.4286	3.8846	0.1437	81.7912	0.9609
	Advice / Payments and transfers	0.5148	0.2413	0.1386	1.9119	0.8178
	Digital banks / Exchange					
	Digital banks / Lending	7.4118	8.0384	0.3558	154.3753	0.488
	Digital banks / Payments and transfers	1.1129	0.3727	0.4358	2.8420	1
	Exchange / Lending					
	Exchange / Payments and transfers					
	Lending / Payments and transfers	0.1502	0.1616	0.0074	3.0549	0.5565
Digitalized	Advice / Digital banks	0.6481	0.2120	0.2593	1.6194	0.8705
	Advice / Exchange	0.0421	0.0249	0.0080	0.2211	<.0001
	Advice / Lending	1.7772	0.6197	0.6695	4.7174	0.648
	Advice / Payments and transfers	0.5779	0.1907	0.2294	1.4554	0.6374
	Digital banks / Exchange	0.0650	0.0341	0.0150	0.2826	<.0001
	Digital banks / Lending	2.7423	0.5908	1.5003	5.0125	<.0001
	Digital banks / Payments and transfers	0.8917	0.1636	0.5334	1.4905	0.9995
	Exchange / Lending	42.1887	22.7237	9.3392	190.5825	<.0001
	Exchange / Payments and transfers	13.7178	7.2247	3.1400	59.9292	<.0001
	Lending / Payments and transfers	0.3252	0.0714	0.1758	0.6014	<.0001
Incumbents	Advice / Digital banks	4.3182	3.2418	0.5278	35.3258	0.4097
	Advice / Exchange	0.2049	0.2098	0.0117	3.6008	0.7264
	Advice / Lending	56.4815	42.3655	6.9170	461.2083	<.0001
	Advice / Payments and transfers	2.8226	2.1295	0.3415	23.3317	0.843
	Digital banks / Exchange	0.0475	0.0346	0.0062	0.3655	0.0003
	Digital banks / Lending	13.0799	2.8121	7.1648	23.8784	<.0001
	Digital banks / Payments and transfers	0.6537	0.1502	0.3435	1.2437	0.4852
	Exchange / Lending	275.6296	200.8154	35.8497	2119.1699	<.0001
	Exchange / Payments and transfers	13.7742	10.0974	1.7691	107.2434	0.0035
	Lending / Payments and transfers	0.0500	0.0114	0.0264	0.0945	<.0001

SOURCE: The Author (2020)

FIGURE 59 - ODDS RATIO BETWEEN SERVICE CATEGORY FOR EACH BANK TYPE



SOURCE: The Author (2020)

When the probability value of a particular type of bank and category of PS service does not appear, it means that the bank does not offer such PS. There are differences between all the types of banks for the categories of digital banks and payments/transfers. Thus, we see that digital banks are the ones that charge the least for the PS offered by them. For the advice category, the incumbent is the bank type whose most charge this type of category compared to the other bank types (no difference).

For the exchange category, we do not find a difference between incumbents and digitalized (digital does not offer). For the lending category, the incumbents charge for a lower number of PS than the digitalized ones, while there is no difference for the digital ones.

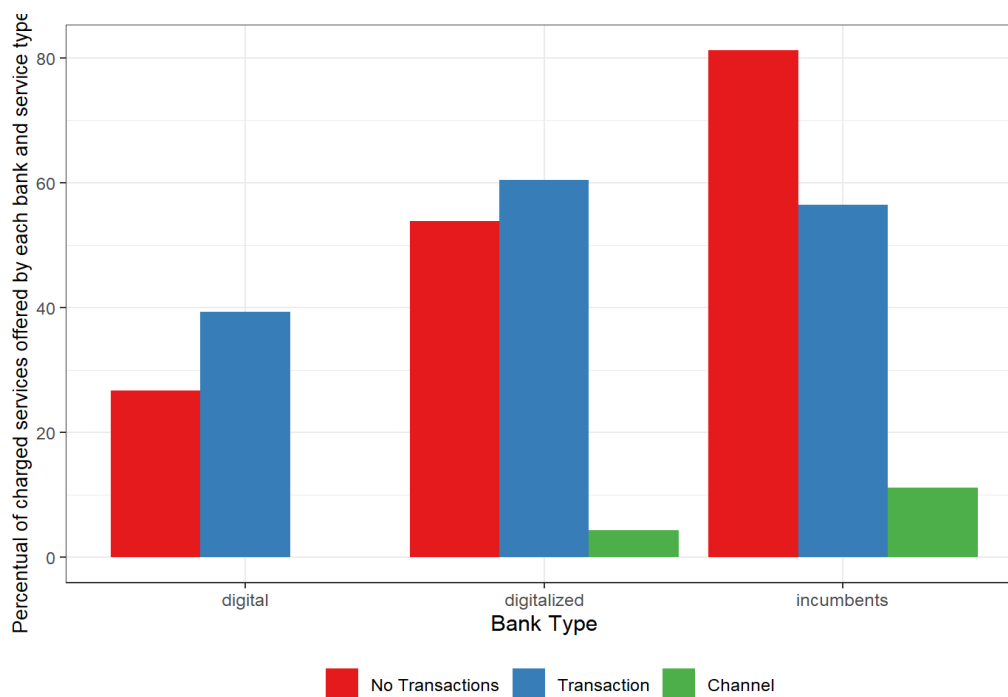
6.2.2.2 Oliveira; von Hippel (2011) first categorization

TABLE 26 - DESCRIPTIVE ANALYSIS AND DATA USED BY MODEL

Type	Category	Offered	Charged	Perc	Not Charged
Digital	No Transactions	30	8	26.67	22
Digital	Transaction	168	66	39.29	102
Digital	Channel	10	0	0.00	10
Digitalized	No Transactions	52	28	53.85	24
Digitalized	Transaction	800	483	60.38	317
Digitalized	Channel	23	1	4.35	22
Incumbents	No Transactions	32	26	81.25	6
Incumbents	Transaction	929	524	56.40	405
Incumbents	Channel	18	2	11.11	16

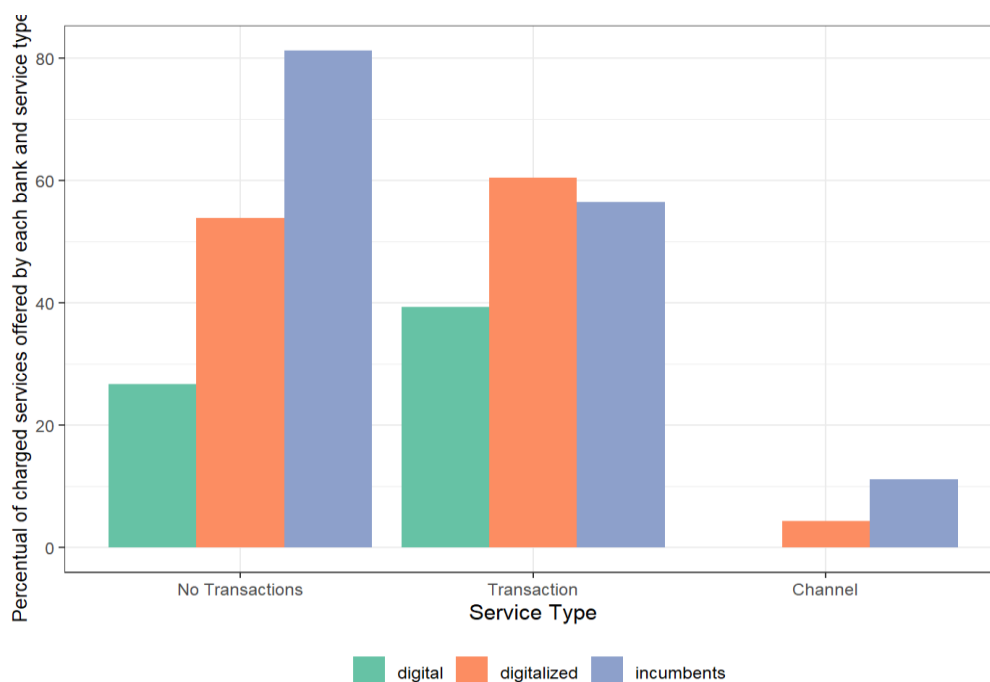
SOURCE: The Author (2020)

FIGURE 60 - DESCRIPTIVE ANALYSIS AND DATA USED BY MODEL ACCORDING TO EACH BANK TYPE



SOURCE: The Author (2020)

FIGURE 61 - DESCRIPTIVE ANALYSIS AND DATA USED BY MODEL ACCORDING TO EACH PS TYPE



SOURCE: The Author (2020)

When using the categorization of Oliveira; von Hippel (2011), digital banks do not charge any type of PS channel and are also the ones that charge least for PS (descriptively).

Table 27 presents the results of the model, in which the interaction was considered significant.

TABLE 27 - ESTIMATED MARGINAL PROBABILITY FOR EACH SERVICE CATEGORY AND BANK TYPE

Type	Category	prob	SE	asympt.LCL	asympt.UCL
Digital	No Transactions	0.2667	0.0807	0.1195	0.4936
Digitalized	No Transactions	0.5385	0.0691	0.3752	0.6939
Incumbents	No Transactions	0.8125	0.0690	0.5951	0.9274
Digital	Transaction	0.3929	0.0377	0.3074	0.4855
Digitalized	Transaction	0.6038	0.0173	0.5618	0.6442
Incumbents	Transaction	0.5640	0.0163	0.5249	0.6024
Digital	Channel	0.0000			
Digitalized	Channel	0.0435	0.0425	0.0039	0.3431
Incumbents	Channel	0.1111	0.0741	0.0204	0.4283

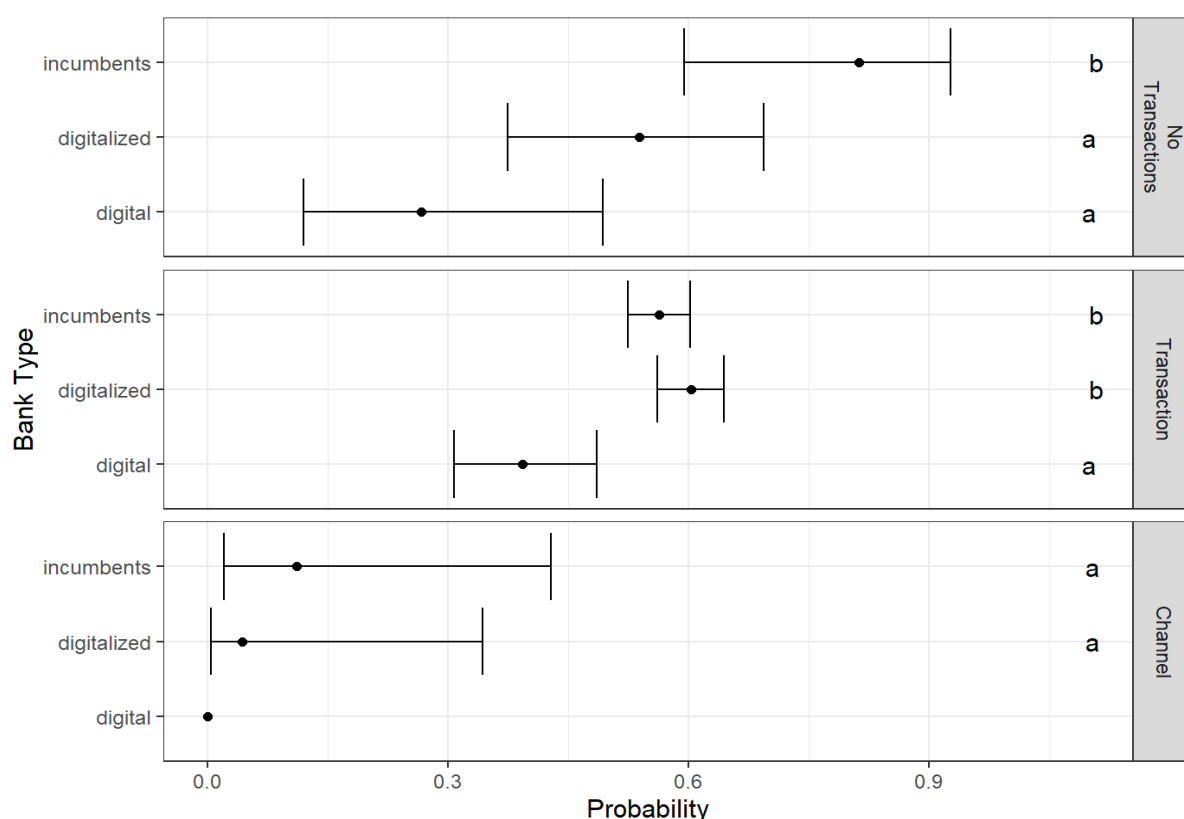
SOURCE: The Author (2020)

TABLE 28 - ODDS RATIO BETWEEN BANK TYPE FOR EACH SERVICE CATEGORY

Contrast	Bank type	odds.ratio	SE	asympt.LCL	asympt.UCL	p.value
No Transactions	Digital / digitalized	0.3117	0.1552	0.0949	1.0232	0.0565
	Digital / incumbents	0.0839	0.0514	0.0194	0.3625	0.0002
	Digitalized / incumbents	0.2692	0.1431	0.0757	0.9578	0.0401
Transaction	Digital / digitalized	0.4247	0.0738	0.2805	0.6430	<.0001
	Digital / incumbents	0.5001	0.0857	0.3323	0.7528	0.0002
	Digitalized / incumbents	1.1776	0.1154	0.9320	1.4881	0.2593
Channel	Digital / digitalized					
	Digital / incumbents					
	Digitalized / incumbents	0.3636	0.4611	0.0176	7.5095	0.8099

SOURCE: The Author (2020)

FIGURE 62 - ESTIMATED MARGINAL PROBABILITY FOR EACH SERVICE CATEGORY AND BANK TYPE



SOURCE: The Author (2020)

TABLE 29 - ODDS RATIO BETWEEN SERVICE CATEGORY FOR EACH BANK TYPE

Contrast	Service category	odds.ratio	SE	asympt.LCL	asympt.UCL	p.value
digital	No Transactions / Transaction	0.5620	0.2484	0.1956	1.6148	0.4732
	No Transactions / Channel					
	Transaction / Channel					
digitalized	No Transactions / Transaction	0.7657	0.2201	0.3855	1.5209	0.7291
	No Transactions / Channel	25.6667	27.1974	2.0443	322.2517	0.0066
	Transaction / Channel	33.5205	34.3594	2.8999	387.4749	0.0018
incumbents	No Transactions / Transaction	3.3492	1.5330	1.1228	9.9906	0.0246
	No Transactions / Channel	34.6667	30.3730	4.2792	280.8388	0.0002
	Transaction / Channel	10.3506	7.7931	1.7148	62.4774	0.0057

SOURCE: The Author (2020)

Figure 62 shows that incumbents banks charge more for PS on “no transactions” category than digitalized and digital banks. The same figure also shows that digital banks charge the least for PS in the “transaction” category.

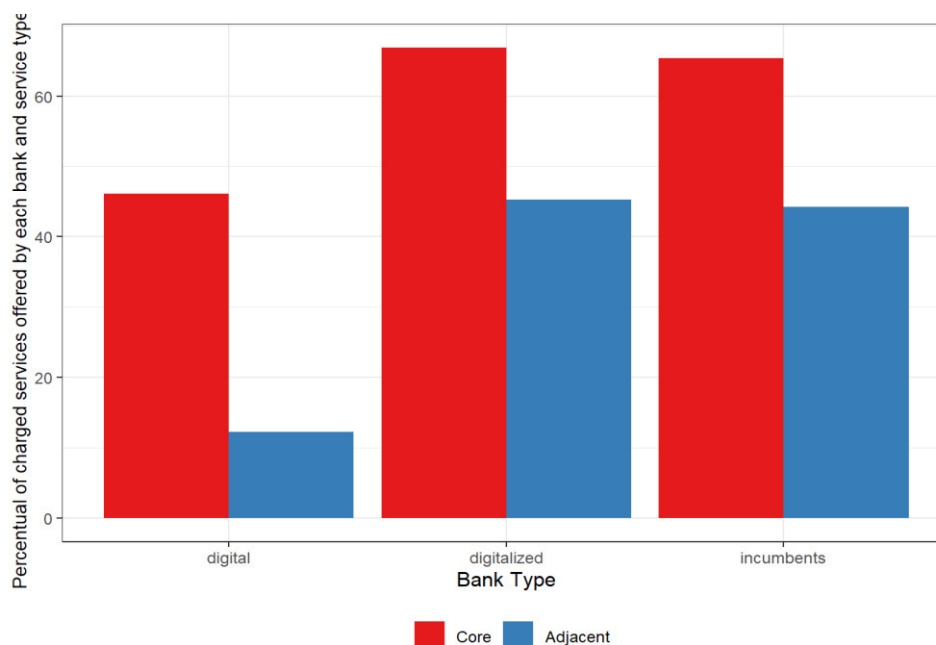
6.2.2.3 Oliveira; von Hippel (2011) II categorization

TABLE 30 - DESCRIPTIVE ANALYSIS AND DATA USED BY MODEL

Type	Category	Offered	Charges	Perc	Not Charged
Digital	Core	143	66	46.15	77
Digital	Adjacent	65	8	12.31	57
Digitalized	Core	535	358	66.92	177
Digitalized	Adjacent	340	154	45.29	186
Incumbents	Core	563	368	65.36	195
Incumbents	Adjacent	416	184	44.23	232

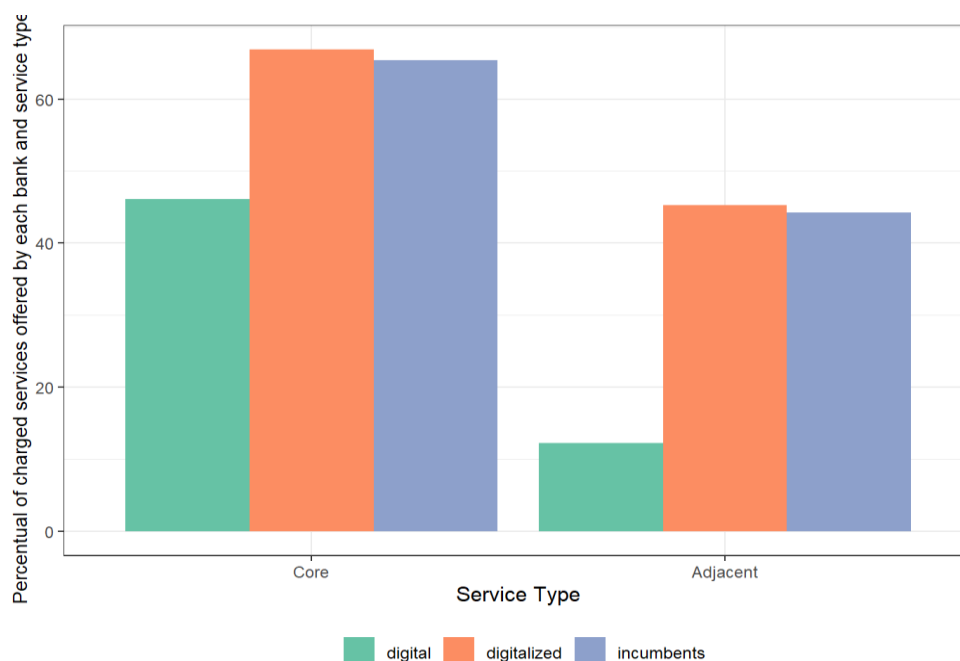
SOURCE: The Author (2020)

FIGURE 63 - DESCRIPTIVE ANALYSIS AND DATA USED BY MODEL ACCORDING EACH BANK TYPE



SOURCE: The Author (2020)

FIGURE 64 - DESCRIPTIVE ANALYSIS AND DATA USED BY MODEL ACCORDING EACH PS CATEGORY



SOURCE: The Author (2020)

For the second categorization of Oliveira; von Hippel (2011), the percentage of PS charged does not seem to vary jointly between the categorization of PS and type of bank. The model results, which did not have significative interaction, are presented in Table 31, Table 32, Table 33, Table 34, Figure 65, and Figure 66.

TABLE 31 - ESTIMATED MARGINAL PROBABILITY FOR EACH SERVICE CATEGORY

<i>Catetory</i>	<i>Prob.</i>	<i>SE</i>	<i>asympt.LCL</i>	<i>asympt.UCL</i>
Core	0.5074	0.0127	0.4791	0.5357
Adjacent	0.3603	0.0129	0.3319	0.3896

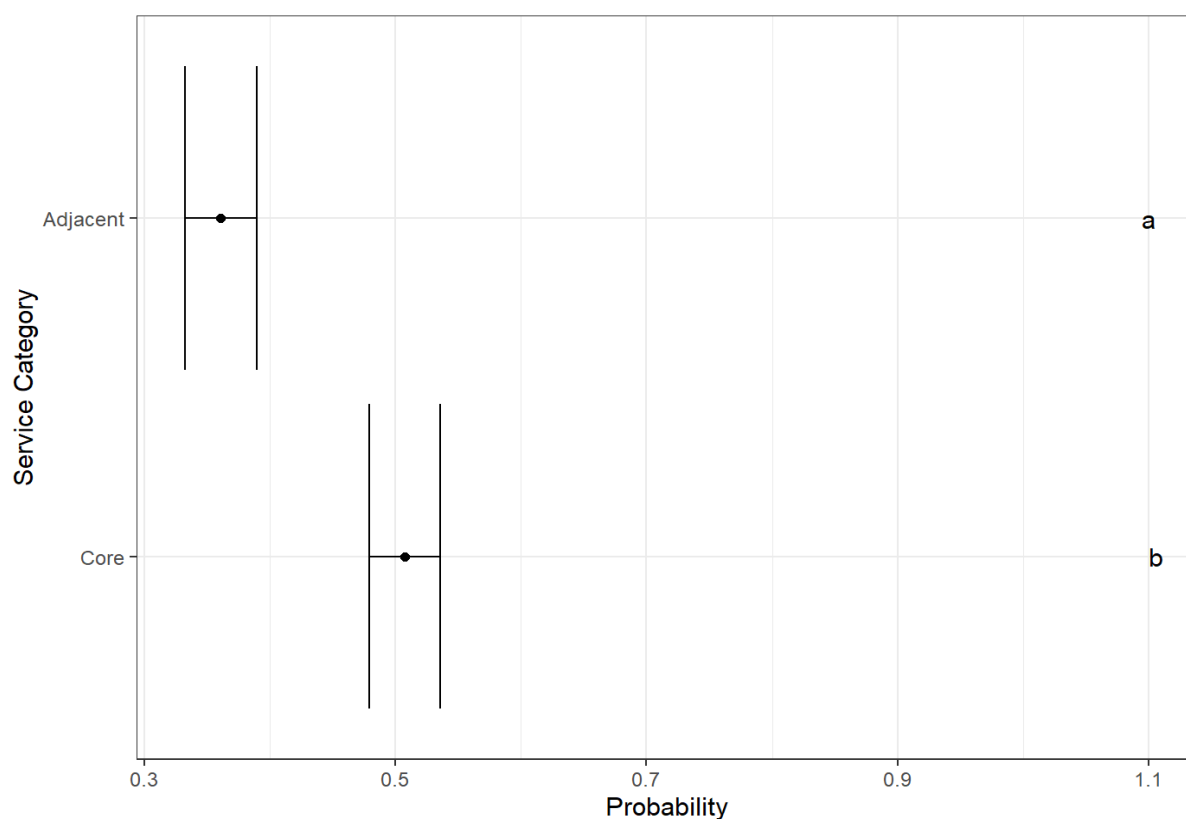
SOURCE: The Author (2020)

TABLE 32 - ODDS RATIO BETWEEN SERVICE CATEGORIES

<i>Contrast</i>	<i>odds.ratio</i>	<i>SE</i>	<i>asympt.LCL</i>	<i>asympt.UCL</i>	<i>p.value</i>
Core / Adjacent	1.8294	0.129	1.5933	2.1005	<.0001

SOURCE: The Author (2020)

FIGURE 65 - ESTIMATED MARGINAL PROBABILITY FOR EACH SERVICE CATEGORY



SOURCE: The Author (2020)

TABLE 33 - ESTIMATED MARGINAL PROBABILITY FOR EACH BANK TYPE

Type	Prob.	SE	asympt.LCL	asympt.UCL
Digital	0.0948	0.0063	0.0809	0.1110
Digitalized	0.4041	0.0108	0.3786	0.4301
Incumbents	0.8615	0.0101	0.8356	0.8838

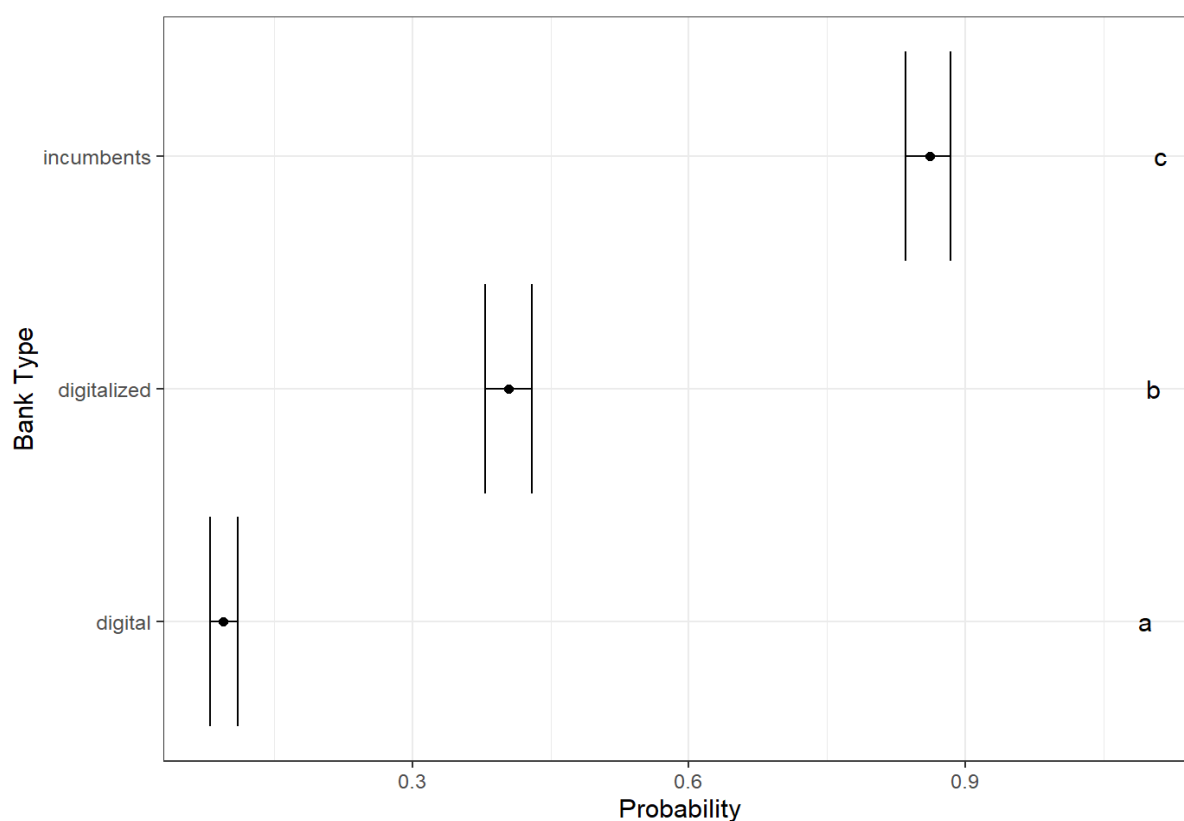
SOURCE: The Author (2020)

TABLE 34 - ODDS RATIO BETWEEN BANK TYPES

Contrast	odds.ratio	SE	asympt.LCL	asympt.UCL	p.value
Digital / digitalized	0.1545	0.0132	0.1261	0.1894	<.0001
Digital / incumbents	0.0168	0.0019	0.0129	0.0220	<.0001
Digitalized / incumbents	0.1090	0.0105	0.0867	0.1371	<.0001

SOURCE: The Author (2020)

FIGURE 66 - ESTIMATED MARGINAL PROBABILITY FOR EACH BANK TYPE



SOURCE: The Author (2020)

The core products had a higher proportion of charge than the adjacent ones. Also, Incumbent bank types had a higher charge ratio than the digitalized ones. These, in turn, had a higher charge ratio than the digital ones.

6.2.2.4 Barbosa; de Paula Rocha; Salazar (2015) categorization

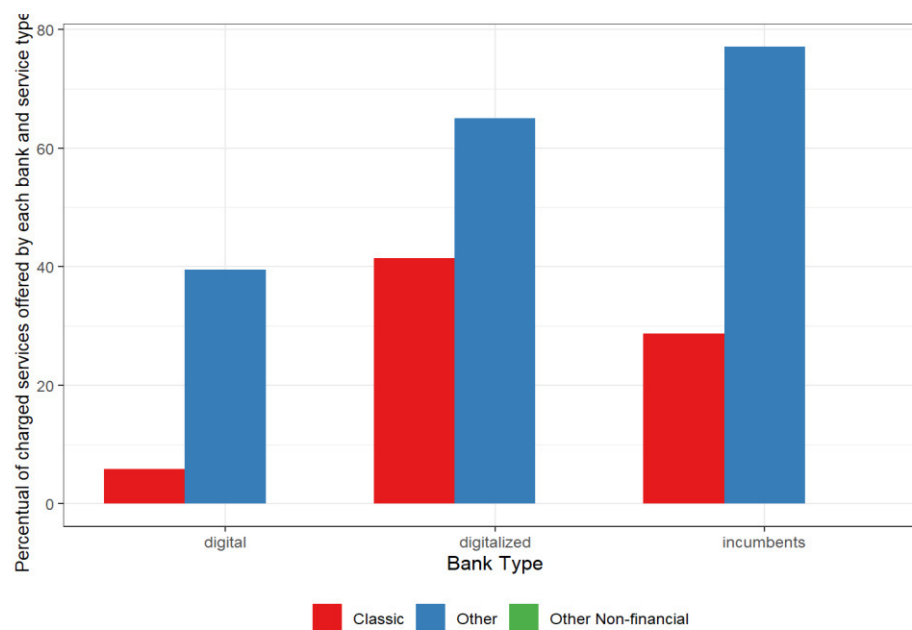
In the categorization of Barbosa; Paula Rocha; Salazar (2015), no PS classified as other non-financial is charged.

TABLE 35 - DESCRIPTIVE ANALYSIS AND DATA USED BY MODEL

Type	Category	Offered	Charged	Perc	Not Charged
Digital	Classic	17	1	5.88	16
Digital	Other	185	73	39.46	112
Digital	Other Non-financial	6	0	0.00	6
Digitalized	Classic	186	77	41.40	109
Digitalized	Other	669	435	65.02	234
Digitalized	Other Non-financial	20	0	0.00	20
Incumbents	Classic	334	96	28.74	238
Incumbents	Other	591	456	77.16	135
Incumbents	Other Non-financial	54	0	0.00	54

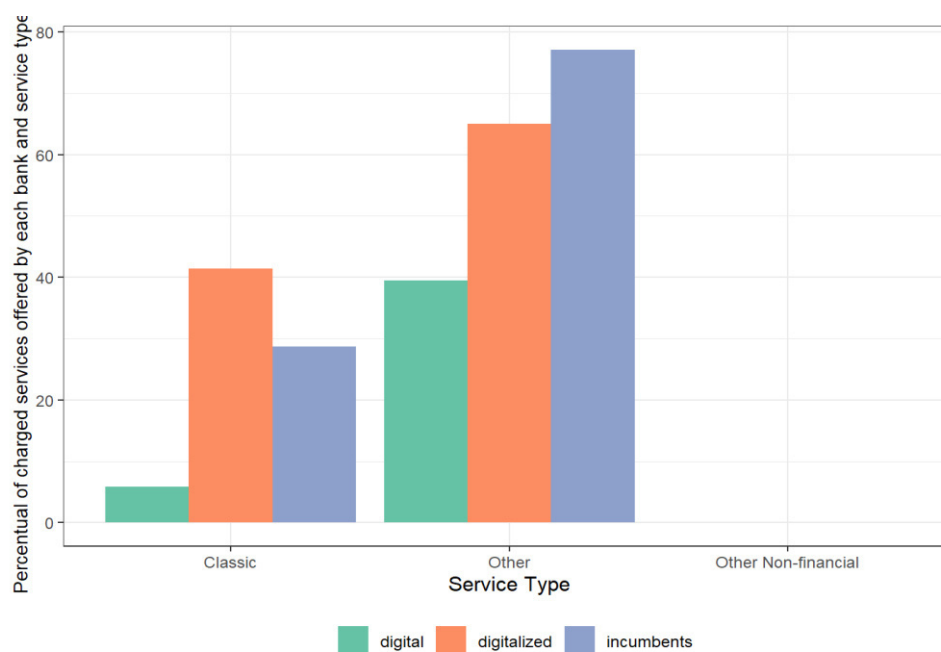
SOURCE: The Author (2020)

FIGURE 67 - DESCRIPTIVE ANALYSIS AND DATA USED BY MODEL ACCORDING TO EACH BANK TYPE



SOURCE: The Author (2020)

FIGURE 68 - DESCRIPTIVE ANALYSIS AND DATA USED BY MODEL ACCORDING TO EACH PS TYPE



SOURCE: The Author (2020)

We present the model results with the interaction in Table 36, Table 37, Table 38, Figure 69, and Figure 70.

TABLE 36 - ESTIMATED MARGINAL PROBABILITY FOR EACH SERVICE CATEGORY AND BANK TYPE

Type	Category	Prob.	SE	asympt.LCL	asympt.UCL
Digital	Classic	0.0588	0.0571	0.0053	0.4228
Digitalized	Classic	0.4140	0.0361	0.3311	0.5020
Incumbents	Classic	0.2874	0.0248	0.2321	0.3500
Digital	Other	0.3946	0.0359	0.3128	0.4828
Digitalized	Other	0.6502	0.0184	0.6050	0.6929
Incumbents	Other	0.7716	0.0173	0.7278	0.8102

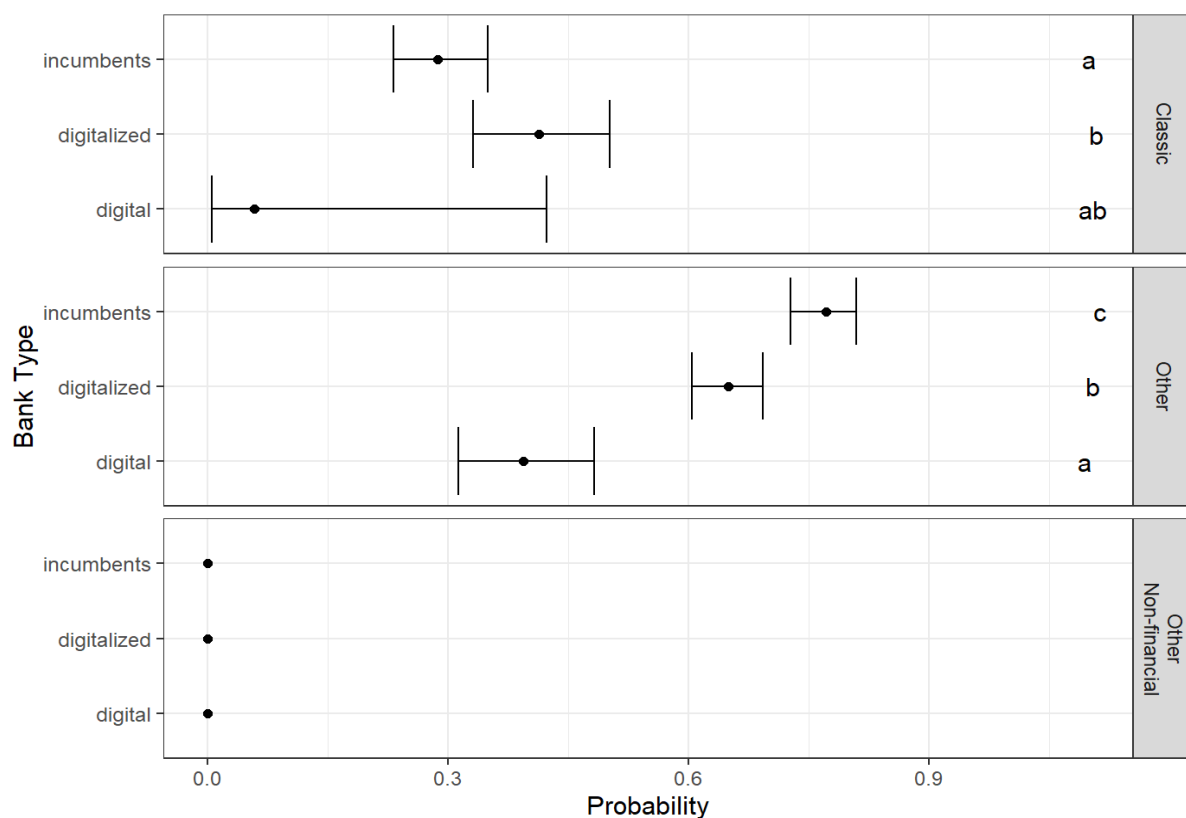
SOURCE: The Author (2020)

TABLE 37 - ODDS RATIO BETWEEN BANK TYPE FOR EACH SERVICE CATEGORY

Contrast	Bank type	odds.ratio	SE	asympt.LCL	asympt.UCL	p.value
Classic	Digital / digitalized	0.0885	0.0921	0.0074	1.0637	0.0585
	Digital / incumbents	0.1549	0.1608	0.0130	1.8468	0.2018
	Digitalized / incumbents	1.7513	0.3359	1.1079	2.7685	0.0104
Other	Digital / digitalized	0.3506	0.0599	0.2331	0.5273	<.0001
	Digital / incumbents	0.1930	0.0346	0.1257	0.2962	<.0001
	Digitalized / incumbents	0.5504	0.0700	0.4062	0.7456	<.0001

SOURCE: The Author (2020)

FIGURE 69 - ESTIMATED MARGINAL PROBABILITY FOR EACH PS TYPE



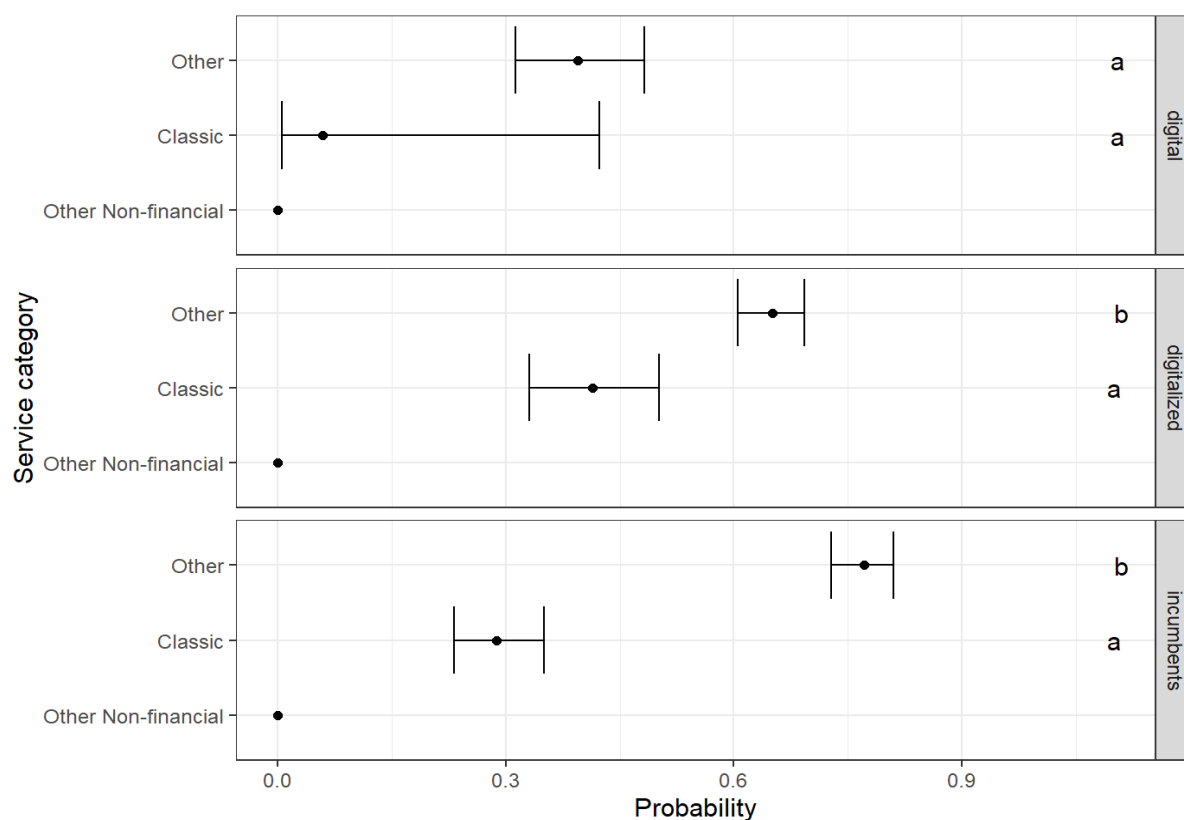
SOURCE: The Author (2020)

TABLE 38 - ODDS RATIO BETWEEN SERVICE CATEGORY FOR EACH BANK TYPE

Contrast	Service category	odds.ratio	SE	asympt.LCL	asympt.UCL	p.value
Digital	Classic / Other	0.0959	0.0999	0.0124	0.7387	0.0244
Digitalized	Classic / Other	0.3800	0.0644	0.2726	0.5298	<.0001
Incumbents	Classic / Other	0.1194	0.0186	0.0880	0.1620	<.0001

SOURCE: The Author (2020)

FIGURE 70 - ESTIMATED MARGINAL PROBABILITY FOR EACH BANK TYPE



SOURCE: The Author (2020)

For classic type services, the digitalized ones have a higher billing proportion than the incumbents (and both do not differ from the digital). For other services, the incumbents had a higher charge ratio than the digitalized ones, which in turn have a higher charge ratio than the digital ones;

As for the type of bank analysis, no one type of bank charges fees for other non-financial PS. Digitalized and incumbent banks have a higher proportion of charges for other categories than the classic one. Meanwhile, for digital banks, there is no difference in the charges for these two PS categories.

6.2.3 Analysis 3 - Compare the type of technology of products and services (Current/New) for each bank

The first objective of this analysis was to describe whether the offer of services between the bank type, service category and technology type, which would categorize a triple interaction.

However, a separate analysis will not be made for each type of PS since there is not enough variability for such comparison among the service category and technology type. Table 39, Table 40, Table 41, and Table 42 exemplify the lack of variability of the data for such comparison:

TABLE 39 - OBSERVED AND RELATIVE FREQUENCY (%) FOR FTCMA CONCERNING THE VARIABLE TECHNOLOGY

<i>FTCMA</i>	<i>Technology</i>		
	<i>Current</i>	<i>New</i>	<i>Total</i>
<i>Advice</i>	7 ; (3.1%)	0 ; (0%)	7 ; (2.9%)
<i>Digital banks</i>	50 ; (22.3%)	1 ; (7.7%)	51 ; (21.5%)
<i>Exchange</i>	31 ; (13.8%)	0 ; (0%)	31 ; (13.1%)
<i>FinTech</i>	0 ; (0%)	7 ; (53.8%)	7 ; (3%)
<i>Insurance</i>	4 ; (1.8%)	0 ; (0%)	4 ; (1.7%)
<i>Investments</i>	12 ; (5.4%)	0 ; (0%)	12 ; (5.1%)
<i>Lending</i>	63 ; (28.1%)	0 ; (0%)	63 ; (26.6%)
<i>Others</i>	1 ; (0.5%)	0 ; (0%)	1 ; (0.4%)
<i>Payments and transfers</i>	56 ; (25%)	5 ; (38.5%)	61 ; (25.7%)
<i>Total</i>	224 ; (100%)	13 ; (100%)	237

SOURCE: The Author (2020)

TABLE 40 - OBSERVED AND RELATIVE FREQUENCY (%) FOR VARIABLES OLIVEIRA I WITH VARIABLE TECHNOLOGY

<i>Oliveira I</i>	<i>Technology</i>		
	<i>Current</i>	<i>New</i>	<i>Total</i>
<i>No Transactions</i>	8 ; (3.6%)	0 ; (0%)	8 ; (3.4%)
<i>Transaction</i>	212 ; (94.6%)	12 ; (92.3%)	224 ; (94.5%)
<i>Channel</i>	4 ; (1.8%)	1 ; (7.7%)	5 ; (2.1%)
<i>Total</i>	224 ; (100%)	13 ; (100%)	237

SOURCE: The Author (2020)

TABLE 41 - OBSERVED AND RELATIVE FREQUENCY (%) FOR VARIABLES OLIVEIRA II WITH VARIABLE TECHNOLOGY

<i>Oliveira II</i>	<i>Technology</i>		
	<i>Current</i>	<i>New</i>	<i>Total</i>
<i>Core</i>	127 ; (56.7%)	2 ; (15.4%)	129 ; (54.4%)
<i>Adjacent</i>	97 ; (43.3%)	11 ; (84.6%)	108 ; (45.6%)
<i>Digitals</i>	0 ; (0%)	0 ; (0%)	0 ; (0%)
<i>Incumbents</i>	0 ; (0%)	0 ; (0%)	0 ; (0%)
<i>Total</i>	224 ; (100%)	13 ; (100%)	237

SOURCE: The Author (2020)

TABLE 42 - OBSERVED AND RELATIVE FREQUENCY (%) FOR VARIABLE BARBOSA WITH VARIABLE TECHNOLOGY

Technology			
Barbosa	Current	New	Total
Classic	74 ; (33%)	1 ; (7.7%)	75 ; (31.6%)
Other	137 ; (61.2%)	11 ; (84.6%)	148 ; (62.5%)
Other Non-financial	13 ; (5.8%)	1 ; (7.7%)	14 ; (5.9%)
Total	224 ; (100%)	13 ; (100%)	237

SOURCE: The Author (2020)

First of all, we classify only 13 PS New. Although this is not an obstacle, as the sample is not balanced - 50% in each group - this does not facilitate comparisons between categories:

- Regarding the FTCMA category, 54% of the PS we categorize as New are also classified as FinTech (and in this case, all Fintech PS are also new);
- For the first category of Oliveira; von Hippel (2011), 92% of the new PS were classified as Transaction;
- For the second categorization of Oliveira; von Hippel (2011), 85% of the new PS were classified as Adjacent;
- For the categorization of Barbosa, Paula Rocha; Salazar (2015), we classify 85% of the new PS as Other.

Thus, analyzing the dataset with both divisions (the type of technology and service categorization) is unnecessary because new PS are represented in only one level of category of all 4 counterparts categories.

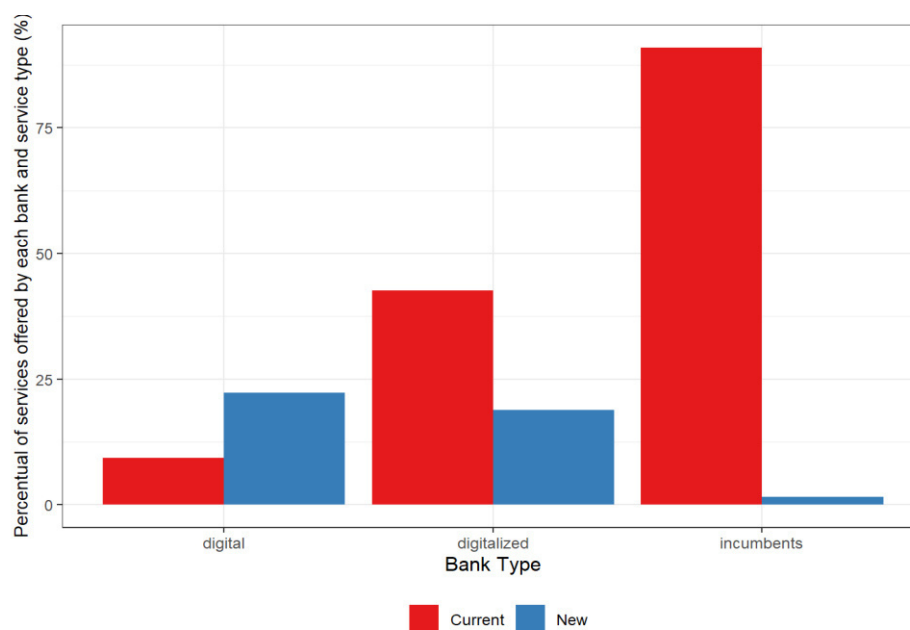
Table 43, Figure 71, and Figure 72 present the descriptive statistics for the type of technology and the PS offers.

TABLE 43 - DESCRIPTIVE ANALYSIS AND DATA USED BY MODEL

Type	Category	Total	Frequency	Perc .	Failure
Digital	Current	2016	188	9.33	1828
Digital	New	117	26	22.22	91
Digitalized	Current	2016	858	42.56	1158
Digitalized	New	117	22	18.80	95
Incumbents	Current	1120	1019	90.98	101
Incumbents	New	65	1	1.54	64

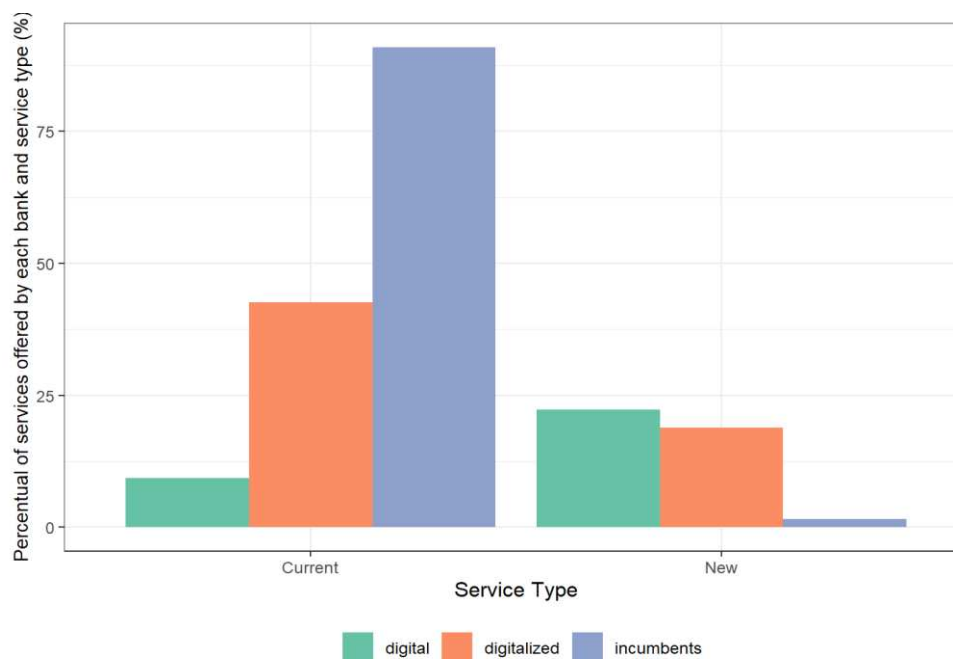
SOURCE: The Author (2020)

FIGURE 71 - DESCRIPTIVE ANALYSIS AND DATA USED BY MODEL ACCORDING EACH BANK TYPE



SOURCE: The Author (2020)

FIGURE 72 - DESCRIPTIVE ANALYSIS AND DATA USED BY MODEL ACCORDING EACH TYPE OF PS



SOURCE: The Author (2020)

Among digital banks, the new PS type has a higher proportion of the offer than the type of PS current. For the other types of banks, the new PS type has a lower proportion of offer than the current PS type. Thus, the interaction is significative in the model, and we present the results in Table 44, Table 45, Table 46, Figure 73, and Figure 74.

TABLE 44 - ODDS RATIO BETWEEN BANK TYPE FOR EACH SERVICE CATEGORY

<i>Contrast</i>	<i>Bank type</i>	<i>odds.ratio</i>	<i>SE</i>	<i>asympt.LCL</i>	<i>asympt.UCL</i>	<i>p.value</i>
Current	Digital / digitalized	0.1388	0.0123	0.1123	0.1716	<.0001
	Digital / incumbents	0.0102	0.0013	0.0075	0.0139	<.0001
	Digitalized / incumbents	0.0734	0.0083	0.0560	0.0963	<.0001
New	Digital / digitalized	1.2338	0.4006	0.5682	2.6788	0.8878
	Digital / incumbents	18.2857	18.8713	1.5557	214.9322	0.0145
	Digitalized / incumbents	14.8211	15.3425	1.2515	175.5272	0.0274

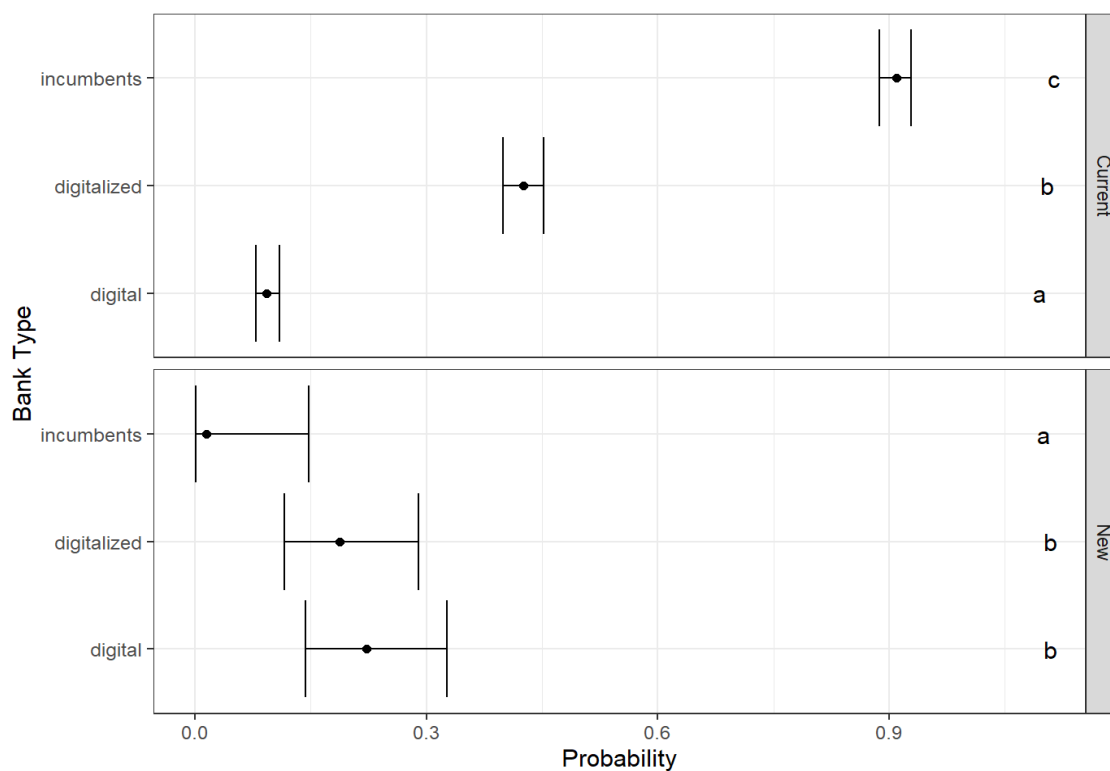
SOURCE: The Author (2020)

TABLE 45 - ESTIMATED MARGINAL PROBABILITY FOR EACH SERVICE CATEGORY AND BANK TYPE

<i>Type</i>	<i>Category</i>	<i>Prob.</i>	<i>SE</i>	<i>asympt.LCL</i>	<i>asympt.UCL</i>
Digital	Current	0.0933	0.0065	0.0789	0.1099
Digitalized	Current	0.4256	0.0110	0.3995	0.4521
Incumbents	Current	0.9098	0.0086	0.8872	0.9283
Digital	New	0.2222	0.0384	0.1438	0.3270
Digitalized	New	0.1880	0.0361	0.1163	0.2895
Incumbents	New	0.0154	0.0153	0.0014	0.1477

SOURCE: The Author (2020)

FIGURE 73 - ESTIMATED MARGINAL PROBABILITY FOR EACH BANK TYPE ACCORDING PS TYPE



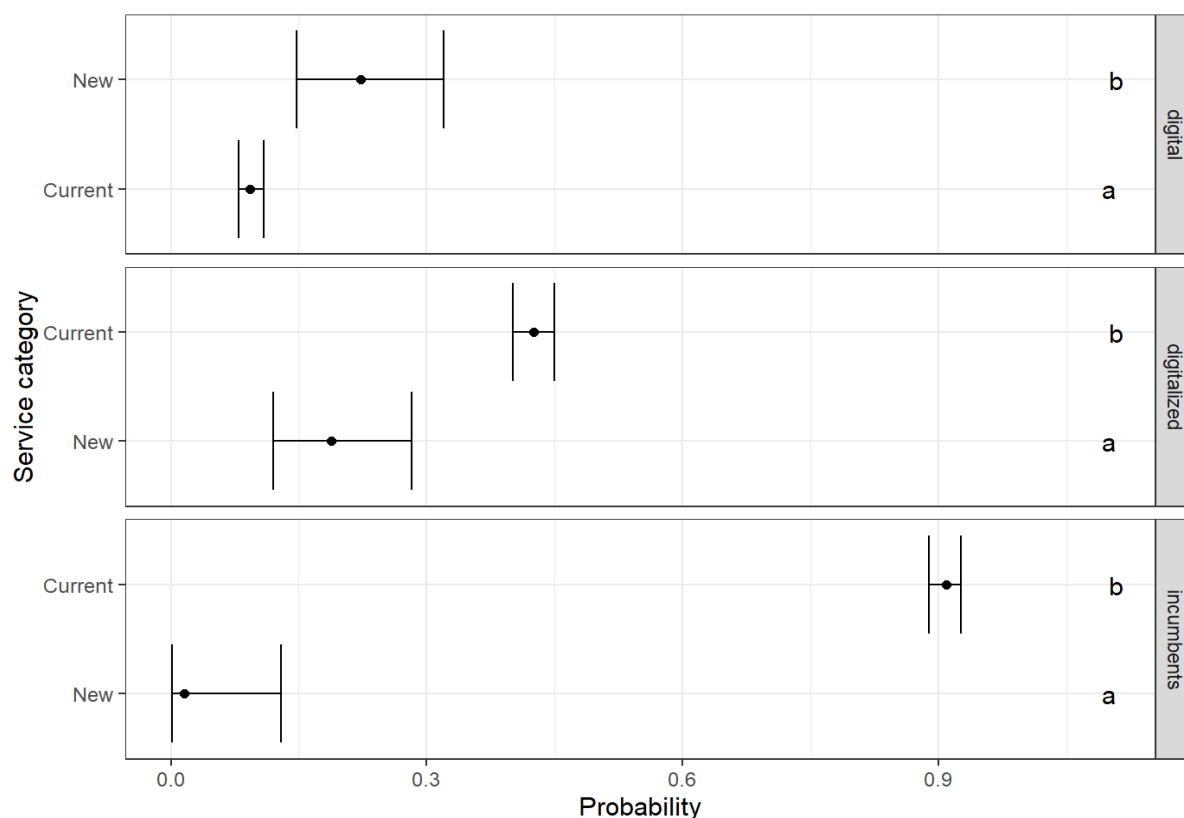
SOURCE: The Author (2020)

TABLE 46 - ODDS RATIO BETWEEN SERVICE CATEGORY FOR EACH BANK TYPE

Contrast	Service category	odds.ratio	SE	asympt.LCL	asympt.UCL	p.value
Digital	Current / New	0.3600	0.0847	0.2270	0.5708	<.0001
Digitalized	Current / New	3.1995	0.7706	1.9956	5.1297	<.0001
Incumbents	Current / New	645.7030	654.2042	88.6389	4703.7169	<.0001

SOURCE: The Author (2020)

FIGURE 74 - ESTIMATED MARGINAL PROBABILITY FOR EACH PS ACCORDING BANK TYPE



SOURCE: The Author (2020)

Among the new PS types, the proportion of offers was the same between digitalized and digital, and higher than incumbents. For each type of bank, the most offered service categories were the incumbent type for the digitalized and incumbent banks and the new type for the digital.

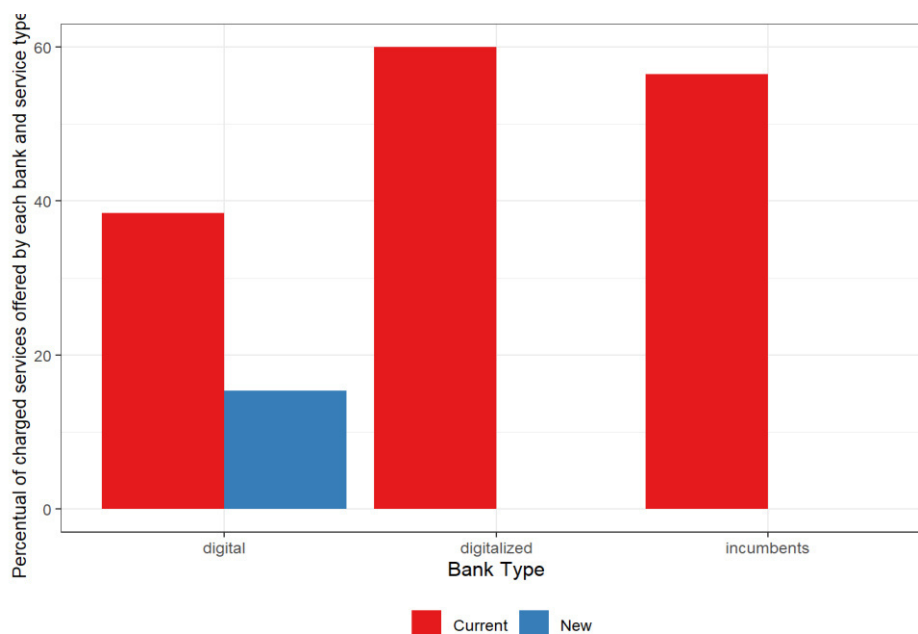
6.2.4 Analysis 4 - Assess whether there is a difference between the amounts charged for PS in relation to the type of technology by groups of banks.

TABLE 47 - DESCRIPTIVE ANALYSIS AND DATA USED BY MODEL

Type	Category	Total	Offered	Perc.	Not offered
Digital	Current	182	70	38.46	112
Digital	New	26	4	15.38	22
Digitalized	Current	853	512	60.02	341
Digitalized	New	22	0	0.00	22
Incumbents	Current	978	552	56.44	426
Incumbents	New	1	0	0.00	1

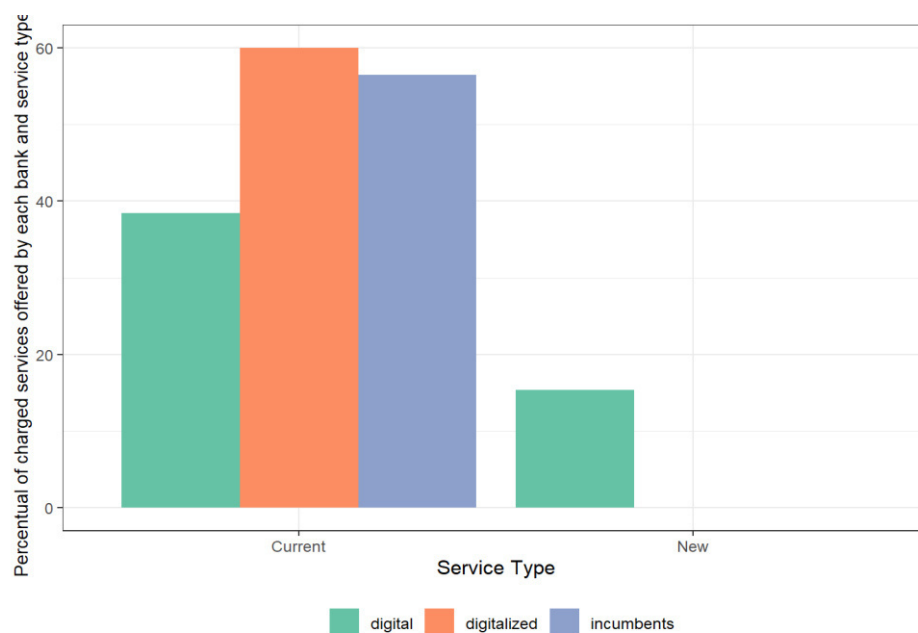
SOURCE: The Author (2020)

FIGURE 75 - DESCRIPTIVE ANALYSIS AND DATA USED BY MODEL ACCORDING TO BANK TYPE



SOURCE: The Author (2020)

FIGURE 76 - DESCRIPTIVE ANALYSIS AND DATA USED BY MODEL ACCORDING TO SERVICE TYPE



SOURCE: The Author (2020)

Although digital banks are the ones that offer the most new-type services, they are also the only ones that charge for such services. Besides, at the incumbent type PS, they are the ones that charge the least for that type of service. The interaction of the model has been significative, as shown in Table 48, Table 49, Table 50, Figure 77, and Figure 78.

TABLE 48 - ESTIMATED MARGINAL PROBABILITY FOR EACH PRODUCT AND SERVICE CATEGORY AND BANK TYPE

Type	Category	Prob.	SE	asympt.LCL	asympt.UCL
Digital	Current	0.3846	0.0361	0.3028	0.4735
Digitalized	Current	0.6002	0.0168	0.5596	0.6395
Incumbents	Current	0.5644	0.0159	0.5263	0.6018
Digital	New	0.1538	0.0708	0.0473	0.3997
Digitalized	New	0.0000			
Incumbents	New	0.0000			

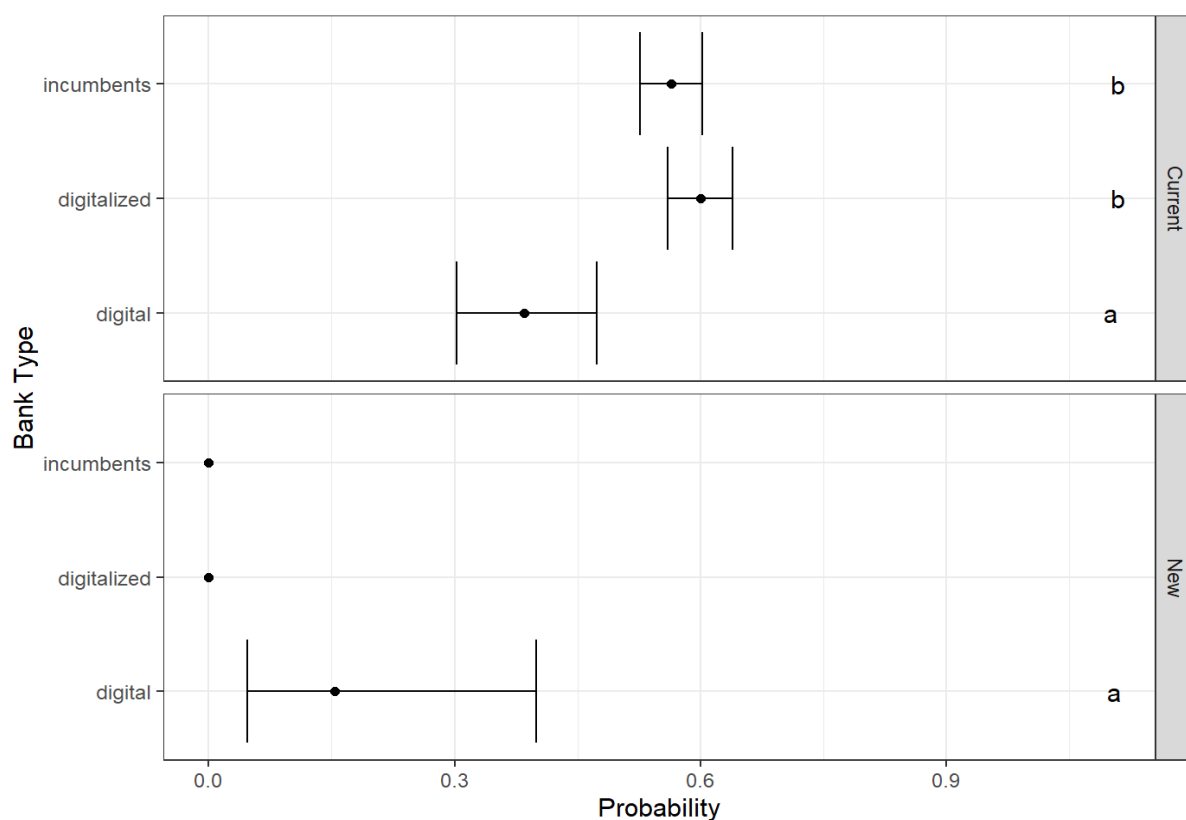
SOURCE: The Author (2020)

TABLE 49 - ODDS RATIO BETWEEN BANK TYPE FOR EACH PRODUCT AND SERVICE CATEGORY

Contrast	Bank type	odds.ratio	SE	asympt.LCL	asympt.UCL	p.value
Current	Digital / digitalized	0.4163	0.0698	0.2790	0.6211	<.0001
	Digital / incumbents	0.4823	0.0798	0.3249	0.7160	<.0001
	Digitalized / incumbents	1.1587	0.1102	0.9233	1.4541	0.3216
New	Digital / digitalized					
	Digital / incumbents					
	Digitalized / incumbents					

SOURCE: The Author (2020)

FIGURE 77 - ESTIMATED MARGINAL PROBABILITY FOR EACH TYPE OF BANK ACCORDING TO PS CATEGORY



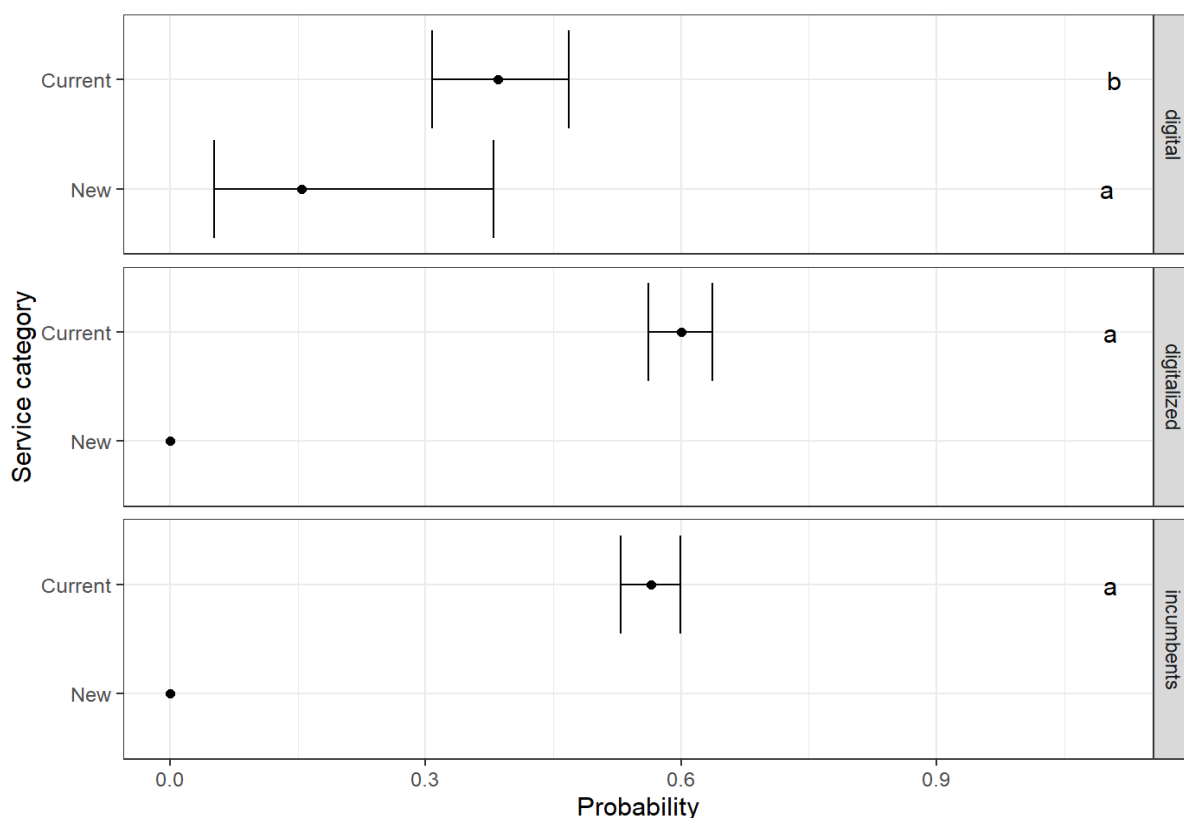
SOURCE: The Author (2020)

TABLE 50 - ODDS RATIO BETWEEN EACH PRODUCT AND SERVICE CATEGORY FOR EACH BANK TYPE

Contrast	Service category	odds.ratio	SE	asympt.LCL	asympt.UCL	p.value
Digital	Current / New	3.4375	1.9405	1.1369	10.393	0.0287
Digitalized	Current / New					
Incumbents	Current / New					

SOURCE: The Author (2020)

FIGURE 78 - ESTIMATED MARGINAL PROBABILITY FOR EACH TYPE OF PS ACCORDING TO BANK TYPE



SOURCE: The Author (2020)

As in the new PS category, only digital banks charge for these PS. We also find that the proportion of new PS type charged for digital is higher than digitalized banks and the incumbent banks. Among the incumbent type of PS, digital banks have a lower proportion of charges for such services than the incumbent and digitalized banks (which do not differ from each other).

6.2.5 Analysis 5 – Products and services offered by Bradesco (incumbent) versus Next (digitalized)

To investigate how different bank type charges PS when pertaining to the same financial corporation; we also analyzed the difference between Bradesco (incumbent) and Next (digitalized). They are both part of Bradesco Corporation.

This section does not compare the types of banks and the PS categories offered. Since Next is a digital bank created by Bradesco, we consider making statistical comparisons between these two institutions. Table 51 presents an overview of all services for both banks.

TABLE 51 – COMPARATIVE OF PRODUCTS AND SERVICES OFFERED BY BRADESCO AND NEXT

Type of PS	Nº os PS	Percentage (%)
<i>Not offered by both banks</i>	32	13.50
<i>Not offered only by Bradesco</i>	4	1.69
<i>Not offered only by Next</i>	123	51.90
<i>Offered by the same price for both banks</i>	32	13.50
<i>PS more expensive at Bradesco than at Next</i>	45	18.99
<i>PS more expensive at Next than at Bradesco</i>	1	0.42

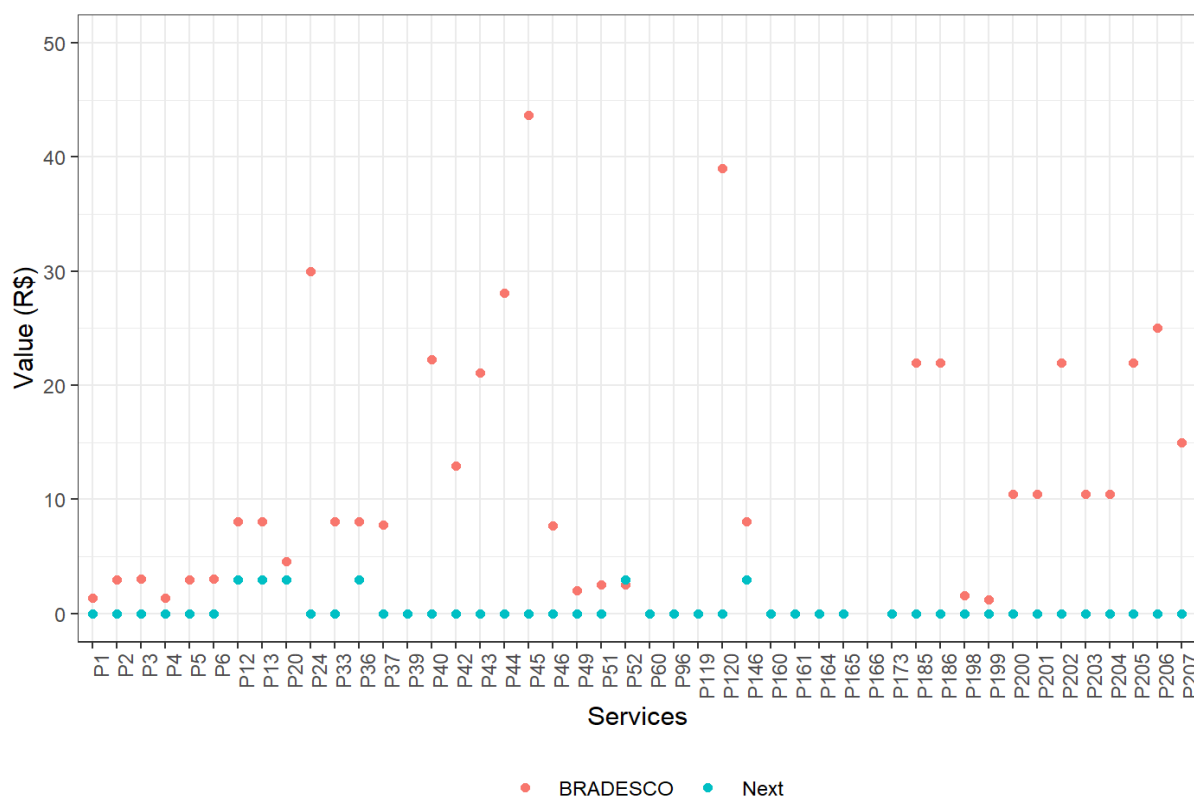
SOURCE: The Author (2020)

From a total of 237 PS, 32 (13.5%) are not offered by any of them, and four PS are offered only by NEXT (and are not offered by Bradesco). Besides, 123 PS (51.9%) are offered only by Bradesco (and are not offered by Next), in which point lies a great difference between the two banks.

Thus, on the date of the survey, the Next offered less than half of the PS offered by the incumbent Bradesco. About fees, 32 PS are offered at the same value by both types of banks. However, the Next offers 45 services cheaper than Bradesco, and only one more expensive. That is, If the client does not need the “123” services not offered by Next, it can be the right choice because Next presents lower costs than Bradesco (if the only concern of a client is about pricing).

Figure 79 shows the value of PS with fees with a price difference up to R\$ 50,00 between these two banks. Some PS have a difference bigger than R\$ 50,00 (outliers), and we choose not to present them in Figure 79, which could prejudice the essential statistical results.

FIGURE 79 – COMPARATIVE OF PS PRICES OFFERED BY BRADESCO AND NEXT



SOURCE: The Author (2020)

The only PS more expensive in the Next than at the Bradesco is the P52. Table 52 complements Figure 79 with the descriptive analysis, including the whole portfolio of PS.

TABLE 52 - DESCRIPTIVE MEASURES FOR PS FEES OFFERED FOR BOTH BRADESCO AND NEXT

Bank	Mean	Median	SD	Min	Max
Bradesco	115.62	11.7	405.756	1.25	2615.00
Next	11.04	0.0	72.189	0.00	489.96

SOURCE: The Author (2020)

We verify that in the PS with value difference between Next and Bradesco, the median of a Next fee is R\$ 0,00, while in Bradesco is R\$ 11,70.

7 CONCLUSIONS

This final chapter aims to present the main results of our research. We start recovering the objectives and answering the qualitative and quantitative research questions. Then, we present the mixed question and, finally, a framework for analysis. As usual, at the end, we present research limitations and suggestions for future researches.

7.1 OBJECTIVES AND RESEARCH QUESTIONS

In this section, we remind the reader about the research objectives (general and specific) and the ten research questions (qualitative, quantitative, and mixed) to answer these previously determined guidelines.

7.1.1 General objective

Propose a framework to analyze the competitive impacts of new innovation-based companies over incumbent banks in the financial industry. In other words, we intend to define the main factors that influence the substitution of banking PS already existing by those offered by digitalized and digital banks.

7.1.2 Qualitative Questions

1. How to identify if digitalized and digital banks represent innovations in comparison to incumbent banks?

We identify that from 15 new PS using new technologies launched in the Brazilian financial market between 2013 and 2019, digital and digitalized banks introduced 11 of them (73.33%). Figure 11 details the characteristics of these PS and the technologies they use. Although some of them present innovations, they use technologies already available as the deposit by *boleto*¹⁴ and money transfer using phone contacts (Banco Inter) and tool payment (C6). These are some examples that banks do not always use new technologies to innovate by launching new PS.

The creation of new PS also requires regulation changes. When the regulators create or adapt the legislation focusing on financial innovations, it motivates new entrants and changes the market dynamics. Regulations about P2P lending, crypto

¹⁴ We explain the PS boleto at the Section 2.4.2 - Non-Banking Companies.

assets, and PI are examples that stimulate new companies to enter the banking industry. For example, some credit card acquires also act as PI, opening accounts to new clients, and broadening their portfolio.

Digital and digitalized banks also exclude the need of their clients to go to brick-and-mortar bank branches to carry out their transactions. The absence of physical spaces is another example of innovation in the financial market. It also reduces their operational costs, allowing these new companies to charge lower fees than incumbents.

Due to the inexistence of physical bank branches, digital and digitalized banks can broaden their scope of clients. In a geographically large country like Brazil, not all clients have a bank branch near their homes. These people then have an opportunity to open a bank account and perform transactions in digital companies. Then, digital and digitalized banks can not make mistakes in the digital environment since this is the only channel available for their clients.

The no use of legacy systems is another innovation of digital and digitalized banks. The legacy systems still in operation in incumbent banks depend on maintenance and specialized workers hard to find in the market. In turn, the new banks already start their operations using new systems, which facilitates their interaction with other systems or incorporates new functionalities.

Still about IT tools, the availability of APIs and the opening for communication with third financial and non-financial companies (e.g., retail stores) are also an innovative and distinctive feature of digital and digitalized banks. Using APIs prepare these companies for future new PS in the market, as the open banking.

Transparency is another innovation brought by new banks. As an example, we illustrate the charge of fees by some incumbent banks. These companies stimulate old and new clients to keep (or open) accounts using the argument of lower fees.

However, sometimes clients consider it hard to explain the conditions to reduce their **fees and rates**. The explanations of terms and conditions of contracts with reduced fees require long explanations, and these contracts have some fine print that can mislead these clients. The situation is distinct in digital and digitalized banks. We verify they highlight their fees and rates (low or free) readily available on their websites and do not apply complex situations to the clients who have access to these advantages.

With the level of concentration in the financial market, new clients see digital and digitalized banks to avoid high fees and interest rates from incumbent banks. Most of these new clients are young people living in a digital world, where the experience of being a “beta-user” of new PS is usual to them. Thus, these clients use new types of banks as a chance to be free of incumbent costs and as a part of their own life experience.

2. What elements and concepts from innovation and competitive advantage theories exist in the relationship among incumbent, digitalized, and digital banks?

Based on the theories of competitive advantage (Industrial Organization and Market Processes) and Innovation (Organising Innovations), we find some concepts and elements that explain the behavior of the banking industry in Brazil face new entrants.

We see the creation or maintenance of **barriers to entry** as an alternative to incumbent banks to deal with **new entrants**. Examples are the specific agreements between these banks and public institutions to collect bills and keep the loyalty of clients. Incumbents with these agreements not allow new companies to collect bills.

Partnerships with digital and digitalized banks can reduce the **inflexibility of incumbent** banks. This type of partnership allows incumbent banks to reduce their operational costs and attend to the **user needs**, acting as a **correction of imbalances**

When the market fails, regulators implement initiatives to increase competitiveness. The upcoming implementation of open banking is a project of BACEN to increase competitiveness and reduce the **asymmetry of information** among banks. With the same information available in the market, several institutions can offer PS to non-clients, for example.

Although the market competition is sometimes hidden, barriers imposed by incumbent banks manifest their unwillingness to provide **APIs** to other companies. These banks try to preserve information about their clients, an invisible asset. As an advantage to clients, new companies using APIs can offer credit with low-interest rates, reducing the profit of **incumbent** banks. Part of these incumbent profits is a consequence of historical high spread rates, which can hide high costs derived from the operational inefficiency of these banks and make room for new entrants.

One of the pioneer innovations offered by incumbent banks is **digital advice** tools. These tools can help users manage their financial budget, split their checking account and credit card expenses in predetermined categories (e.g., public transportation), and create expenditure limits for some of them. This type of service is an **incremental innovation** to compete with the **new entrants**, mainly **digital banks** (e.g., Nubank), and reduce **information asymmetry** between financial institutions and clients.

Digitalized and digital banks can perform operations with low-profit rates to incumbent banks. These companies can use their reduced costs to offer law-mandatory credit operations as microcredit, with low-profit rates, incumbents not always offer to the market their needed balance.

To increase the transparency to clients and keep loyalty, digital and digitalized banks motivate their clients to use their accounts via cashback. The refund of part of the amounts spent on PS or purchases by credit or debit cards in the form of cash is a more concrete method of being perceived by customers. The traditional alternative to this innovation is the loyalty programs of the incumbent banks. However, this form of refund has a lower transparency level for customers because not all adopt the same criteria.

Closing bank branches and reducing employees are, at the same time, an impact and an attempt of incumbent banks to deal with the low operational costs of new entrants and the innovation brought by digitalization in the banking industry. Incumbent banks create specific departments in their organizational structure to deal with innovations. Santander and Itaú are two examples.

Banks are also looking to innovate using innovation spaces. These spaces are physical (or digital) meeting points where new financial and non-financial companies interact with banks to create new PS or improve existing ones. Initiatives are InovaBra (Bradesco) and Cubo (Itaú) are some examples.

Digitalized and digital banks are not the only new types of entrants in the banking industry. Recent regulations in Brazil allows the creation of AAls and flexibilization of financial activities by non-bank companies (e.g., PI).

In the future, the tendency is increasing the **external rivalry** by companies of other industries. Digital and digitalized banks offering products from third parts in their platforms become similar to a marketplace. Another new concept from the banking industry is banking as a service, offering products from third parts.

However, an **ATM** company launches a solution as the QR Code for the people that do not have a bank account. This innovation can be a threat even for the banks because it reduces the need for bank accounts. Then, from the banking system, its type of **substitute product** is an **innovation** that can generate a reversal effect on the banks that try to open accounts and retain their clients.

Finally, the migration of senior executives of incumbent banks to digitalized and digital ones can transfer know-how to these new companies.

3. What characteristics of incumbent banks present innovative and competitive advantages or disadvantages in relation to digitalized and digital banks?

As **advantages**, we begin with the **invisible assets**. The rivalry between incumbent banks and the other banks is mostly defined by protecting these invisible assets. The knowledge of the past actions of their clients, the strongness of their brands, their credibility, the know-how, and the loyalty of their clients. When incumbent banks resist sharing information with digitalized and digital banks, they try to **value their sticky factors** and their **invisible assets**. Past investments on these two types of concepts are sunk costs; that is, those costs that banks can not recover.

We pose loyalty retention as one example of an **invisible asset**, as the automatic debit collection in checking accounts, one the means to retain clients. If new companies can also receive these types of bills, some clients can change their habits and the incumbent banks can lose clients to these new entrants. However, as incumbent banks had costs in the past to obtain and retain these clients, they have an intrinsic and invisible value.

Incumbent banks also have money enough to compete using the **deep pockets** strategy. Then, as these companies have more budget to invest in improving their efficiency through new routines or adapting the already ones, deep pockets are a viable solution for most of these issues. New companies, however, have funding problems when facing a dispute with incumbent banks. One example is the lack of resources for new credit operations during the covid-19. At that time, some digital banks use the incumbent banks as funding sources for their credit operations.

Deep pockets also help incumbent banks to invest in new companies similar to the new ones. The creation of Digio (Bradesco and BB) and Next (Bradesco) are two examples of initiatives to compete in the same business model as the digitalized

and digital banks. Then, even in the same financial sector, the creation of new companies to compete with those already active can result in new **strategic groups**.

Acting as full-service banks, the incumbents also have broad portfolios of PS. The same user can satisfy its needs using PS like credit, insurance, and investments, for example. In turn, digitalized and digital banks have a narrow portfolio. We discuss it in the section of quantitative questions.

Although the most significant number of banking transactions happens via digital channels, **bank branches** are massive sales points for PS and negotiations most important to banks/customers, for example. It is an advantage in a country geographically large and with problems in the availability of the internet. In places with limited access to the internet, clients will have issues with logging their digital accounts using the internet. Then, these physical spaces are competitive advantage of incumbent banks.

Due to their market power from concentration, incumbent banks define the timing and the adoption of innovations. One example is the discussion about the APIs that will be employed in the open banking. Incumbents can have an advantage in establishing their patterns, which increases the barriers to entry of new competitors.

As the first disadvantage, incumbent banks can make mistakes competing with new companies that use new technologies. The use of legacy systems is one example of an element that can prejudice that fast adoption or increase the potential errors by incumbents. One example is the use of the same back office of Bradesco on their digitalized bank Next. Digitalized and digital institutions that are “digital-born” are more prepared to adopt new technologies and offer new PS to their clients.

In Brazil, banks measure their **operational efficiency** using operational costs divided by their revenues with fees. Then, the **fees** are essential to pay the operational structure of the incumbent banks and are directly related to the efficiency indexes of these banks. In the past, when incumbent built their operational structures, they assume a commitment to these investments. Also, large operational structures become a sticky factor that depends on incumbent bank fees to existing.

Bank branches are, at the same time, an advantage and a disadvantage. In addition to higher operational costs to maintain these structures, incumbent banks can address issues with clients that they can not solve in digital channels to physical channels. Then, solving issues in branches can difficult the full implementation of

digital solutions in these banks because they have a physical option to solve issues of their clients.

Another disadvantage is about who owns the bank, private or public investors. As two of the five biggest banks have public participation (BB and Caixa), these companies also depend on the public sector to adopt innovations. This raises the inflexibility of these institutions when they need to deal with the dynamics of markets.

The availability of staff specialized in new technologies. Like workers of incumbent banks traditionally came from educational sectors of Business Administration and Economics, they can not have the skill to deal with the most recent developments in IT as digitalized and digital workers.

4. What are the competitive and innovative reactions of incumbent banks after the emergence of digitalized and digital banks?

One of the most relevant reactions is the establishment of partnerships to implement digitalized and digital banks. These new companies were created jointly with another incumbent bank (e.g., digital bank Digio) or even inside the own incumbent bank (e.g., Next). As in other sectors (e.g., ATM company Tecban), incumbent banks have the necessary know-how to create new companies to serve the banking industry.

Anticipating future innovations, these partnerships can also be established with companies from other industries, as BigTechs. In 2020, companies owned by Bradesco and BB tried to implement a payment system in cooperation with Facebook. The BACEN canceled this attempt justifying to avoid increasing concentration in the banking industry. The regulator explained that he plans to launch a specific regulation on interoperability between these types of companies.

Incumbent banks also adopt new technologies (e.g., AI) or planning to insert them in their future outlook (e.g., blockchain and crowdfunding). One example of the adoption of AI by Bradesco. Jointly with IBM, the bank develops a system called *Bradesco Inteligência Artificial* (BIA), which has more than 200 thousand answers to questions of clients about more than 59 PS¹⁵.

¹⁵ Source: <https://www.ibm.com/blogs/ibm-comunica/com-bia-bradesco-e-ibm-transformam-o-atendimento-de-milhoes-de-usuarios/>, access on 11/06/2020 at 14h18.

The creation and maintenance of barriers to entry is another strategy adopted by incumbent banks against digitalized and digital ones. The first example are the lawsuits filed against new entrants, as the law action from 2014 between Bradesco and the GuiaBolso, a FinTech of financial advice. Incumbent representatives argue that new entrants can not capture profits obtained from past investments on operational structure (e.g., bank branches and human resources) of incumbents without paying for their use.

The second is a demand for compensation from new entrants that may, in the future, support part of the operating costs that the incumbents have with the maintenance of their structures. Incumbents also try to recover operational costs in the high prices charged for an ATM company owned by the five incumbent banks (TecBan), another barrier to digitalized and digital banks.

The third is the resistance of incumbent banks to do not allow new entrants to collect bills and taxes. In the current context, only banks with agreements signed with government agencies or public utility companies can receive this kind of payment. Government institutions argue the model has been reviewed, which will reduce the barriers to entry. However, new initiatives proposed by governmental regulators think about creating a self-regulation and a centralization of these collections in an already existent centralizer of payments and collections (CIP) (118:1).

7.1.3 Quantitative questions:

1. Is there a statistical difference among the availability of PS offered by incumbent, digitalized, and digital banks?

Yes. In the first analysis (FTCMA - Table 9), among nine categories of PS, incumbent banks dominate seven (payments and transfers, other, lending, investments, insurance, exchange, and digital banks). with significative difference (p-value < 0.05). The advice category did not present a significative difference between incumbent, digitalized, and digital banks, as shown in Figure 43, while in FinTech, digitalized and digital banks dominate this category over incumbents (p-value<0.05).

According Oliveira; von Hippel I (2011) analysis, incumbents have most transaction-type PS with significant difference and the same number of PS in the “channel” and No Transaction category as the digitalized ones (Table 12).

Results from Oliveira; von Hippel II (2011) categorization shows that the offer of “core” PS is significative higher than the “adjacent” type of PS (50.74% - Table 31).

In this analysis, the three types of banks have the same probability of offering a core (or adjacent) type of PS.

Finally, in the three analysis of Barbosa; de Paula Rocha; Salazar (2015), incumbent banks are the most likely to offer the “classic” (94.13%), “other” (82.84%), and “other non-financial” (77.14%) type of PS than the digitalized and digital banks (Table 20).

2. Are there differences among the fees charged by incumbent, digitalized, and digital banks?

Considering the availability of PS in the FTCMA, digital banks have lower fees in the categories of payments and transfers and (the category) digital banks (Table 24).

In the first Oliveira; von Hippel (2011) categorization, the digital ones do not charge any kind of “channel” PS and are also the ones that charge less for other services ($p\text{-value} > 0.05$). In the Barbosa; de Paula Rocha; Salazar (2015) categorization, digitalized and incumbent banks have a higher proportion of fees for “other” categories than the “classic” one.

3. What are the differences in the technology adopted in PS offered by incumbent, digitalized, and digital banks?

Digital banks have a higher offer-ratio of PS in the category “new” than the digitalized and digital ones (Table 44) with a significative difference.

4. Is there a statistical difference between the fees charged for PS concerning the type of technology by the three types of banks?

In the category “new,” only the digital banks charge for services. Then, we conclude that the ratio of PS charged for digital banks in the category “new” is higher than the digitalized and digital ones (Table 50)

In addition, we will ***identify if there are differences between the availability of PS and the fees charged by the banks Bradesco (incumbent) and Next (digitalized).***

Among a total of 237 services, 32 (13.5%) are not offered by any of them, four services are not offered by Bradesco (and only by Next), while 123 (51.9%) are not

offered by Next (and only by Bradesco). Considering PS offered by these two banks, 32 have the same fee and the Next offer 45 cheaper PS than Bradesco (and one more expensive - Table 51).

Then, we may conclude that Next charges less than Bradesco.

7.2 MIXED QUESTION

How to build a framework to analyze the competitive impacts of new innovation-based companies over incumbent banks in the financial industry?. In other words, what are the main factors that influence the substitution of banking PS already existing by those offered by digitalized and digital banks?.

To explain and predict the future of the banking industry, we answer this question in the next section.

7.2.1 Metainference

In this section, we use the Mixed Methods to join the qualitative and quantitative analysis to finish our conclusion. As we use the exploratory design, we will discuss and conclude our research through an overall interpretation of the literature and the results. We also outline future prospects for the banking industry, with all three types of banks.

In the competition among incumbent, digitalized, and digital banks, we find six theoretical concepts from the three theories we adopt in this work. The first theory, industrial organization, contributes to the analysis of barriers to entry and sticky factors. Correction of imbalances and invisible factors are the elements of market processes theory. Finally, the power of deep pockets and the creation of new PS are the concepts from the organising innovations.

Information is an invisible asset that incumbents try to protect. In turn, digital and digitalized banks try to capture this asset from incumbents through the use of **APIs**, PS created by regulators (e.g., **open banking**), and even creating partnerships between these two new types of banks. These partnerships combine the credibility, know-how, funding, and deposit accounts from **digitalized** (mostly medium-sized) banks, and flexibility, perception of newness, and innovation by new PS from **digital banks**.

These partnerships demand agility from incumbents and threaten their positioning through the fast timing of innovations. Although incumbent banks verticalize their activities, joint efforts of digitalized and digital banks can complement their weaknesses. **Digitalized and digital banks** incorporate adjacent activities into the banking industry. These banks are becoming similar to marketplaces, where people shopping, check their accounts, and carry out several transactions.

In turn, incumbent banks have, recognize, and protect their invisible assets, keeping their clients and information about them. Refusal to access their APIs and lawsuits against new entrants are some examples of barriers to entry that incumbents use. Also, they have credibility, a broad offer of PS, deep pockets, and bank branches to compete with new types of financial institutions. Their refusal to open APIs to other agents is a manifestation of these barriers to entry.

Thus, incumbent banks are controversial in their official statements about **partnerships with digitalized and digital banks**. On the one hand, they encourage innovation, establish partnerships, invest in new digital companies; on the other hand, they question factors that could favor these actions. One example is the standardization of **APIs** for **open banking**, a source of controversy among institutions. Although the new types of banks ask for API standardization to ease partnerships, incumbent banks claim their developed in-house API to improve transaction security.

The incumbent Bradesco attempt to launch Next as a digitalized bank can result in new clients that did not have a previous account in the same incumbent institution but choose to open a digital account. However, it is a doubt if a digitalized bank shares **their legacy systems with the incumbents**, which can generate the same problems and risks as the incumbents.

As in the Bradesco and Next case, if incumbents digitalize their activities using the same old legacy systems, they create a “digital mask” for their clients. Although these banks try to recover the most out of their past costs using legacy systems, the perception of clients about this mask can prejudice incumbents.

As the sticky factors of legacy systems, incumbents use their bank branches as a second option when they fail in the digital channel. In Brazil, the “come to your branch” notice is common on the screens of clients who can not finish their transactions. In contrast, digitalized and digital banks do not have branches as a second option to their clients.

The rigidity of their own organizational structures may hamper incumbent banks. We perceive their concern about operational efficiency by the disclosure of plans to close branches and reduces their operational structures. Recently, we verify the reduction of the old operational structure of the former HSBC by Bradesco and the announcements of gradual closure of bank branches by Itaú and by Bradesco itself.

Brazilian regulators of the financial market motivate new entrants by creating **new PS** and changing the already existing. These actions aim to reduce the information asymmetry and market imbalances, two components of the spread rates of interest in the financial market. Recent **regulations** in Brazil allow new entrants, such as the AAls, and the flexibilization of financial activities by non-bank companies (e.g., PI).

When analyzing competition in the financial markets, we can not incur the error of simplifying the issue. We are not looking for a “winner” in the market. In the future, we conclude that the market will split among incumbent, digitalized, and digital banks. Besides, we can not overrule that other new entrants (e.g., FinTechs and AAls) will also increase their market share.

The analysis of competitiveness in the sector from the perspective of the five incumbent banks against digital banks ignores the role of the medium-sized banks. These banks present lower operational costs (compared to incumbents) and show a willingness to share their operations with other banks and FinTechs.

Medium-sized banks have a specific focus on specific types of operations (e.g., investments or wholesale credit). Partnerships can increase the portfolio of these banks and boost their exposure to smaller clients. This way, they can expand their business without creating specific areas through partnerships with existing digital banks.

As an example, the Original bank (medium-size) calls itself the future business hub. The company is open and motivate partnerships with other digital banks and FinTechs. Then, the future of the banking sector will not be determined by the big incumbent or the small (but growing) digital banks. Medium-sized banks can establish profitable partnerships with digital banks by opening their businesses to these companies.

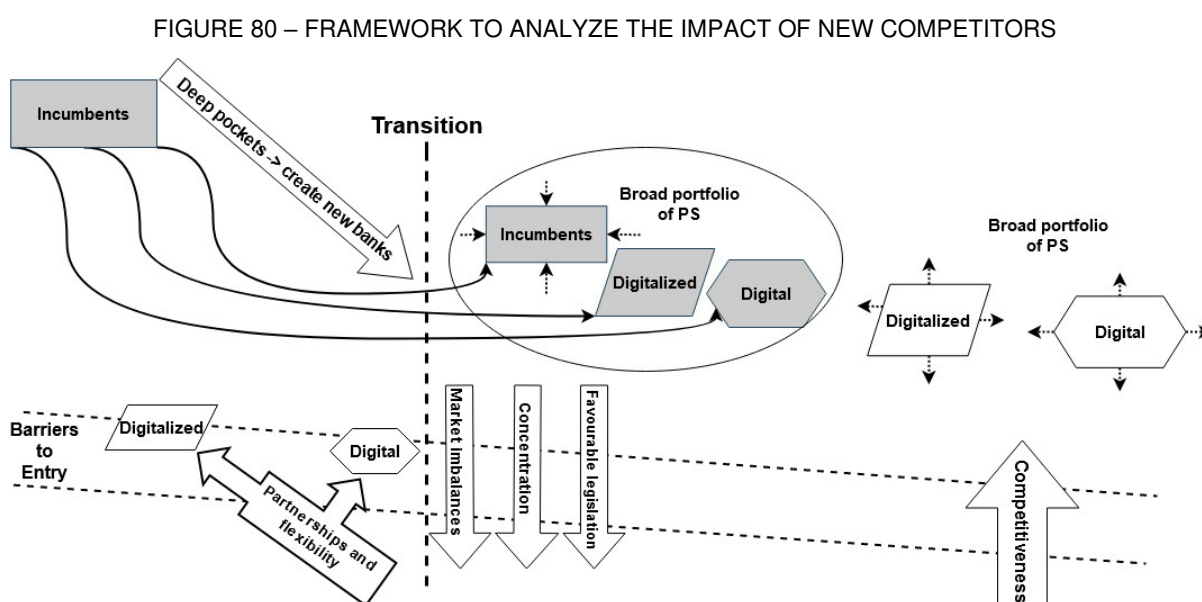
Open banking will demand partnerships in the banking industry. Also, it requires a flexible infrastructure to allow several types of companies entering in the system. Data about clients is a valuable **invisible asset** of incumbent banks. Even

with a regulation that requests the availability of the data of incumbent banks to other companies, these banks have **market power** and **deep pockets** to create alternatives to difficult the capture of these data.

However, this implementation will reduce the asymmetry of information between the incumbent, digitalized, and digital banks. This leveling of data allowing greater integration of the records of good and bad payers and can act in reducing interest rates.

7.3 FRAMEWORK TO ANALYZE NEW COMPETITORS IMPACT

Figure 80 summarize the elements we choose when analyzing the competition between the incumbent, digitalized, and digital banks.



SOURCE: The Author (2020)

Each type of figure represents a bank type. The size of each type of bank represents its market power. The double dotted horizontal line represent the barriers to entry in the banking industry. The vertical line centered is the time change between today and the future. Others illustrations have specific captions to identify them

Today, although the market threats by new entrants, incumbent banks have deep pockets as an advantage. They can create or invest in their own digitalized and digital banks (e.g., Bradesco, Next, and Digio). Their position above the barriers to entry line illustrates their expertise in the market, a broad portfolio of PS, and the high level of concentration in the industry.

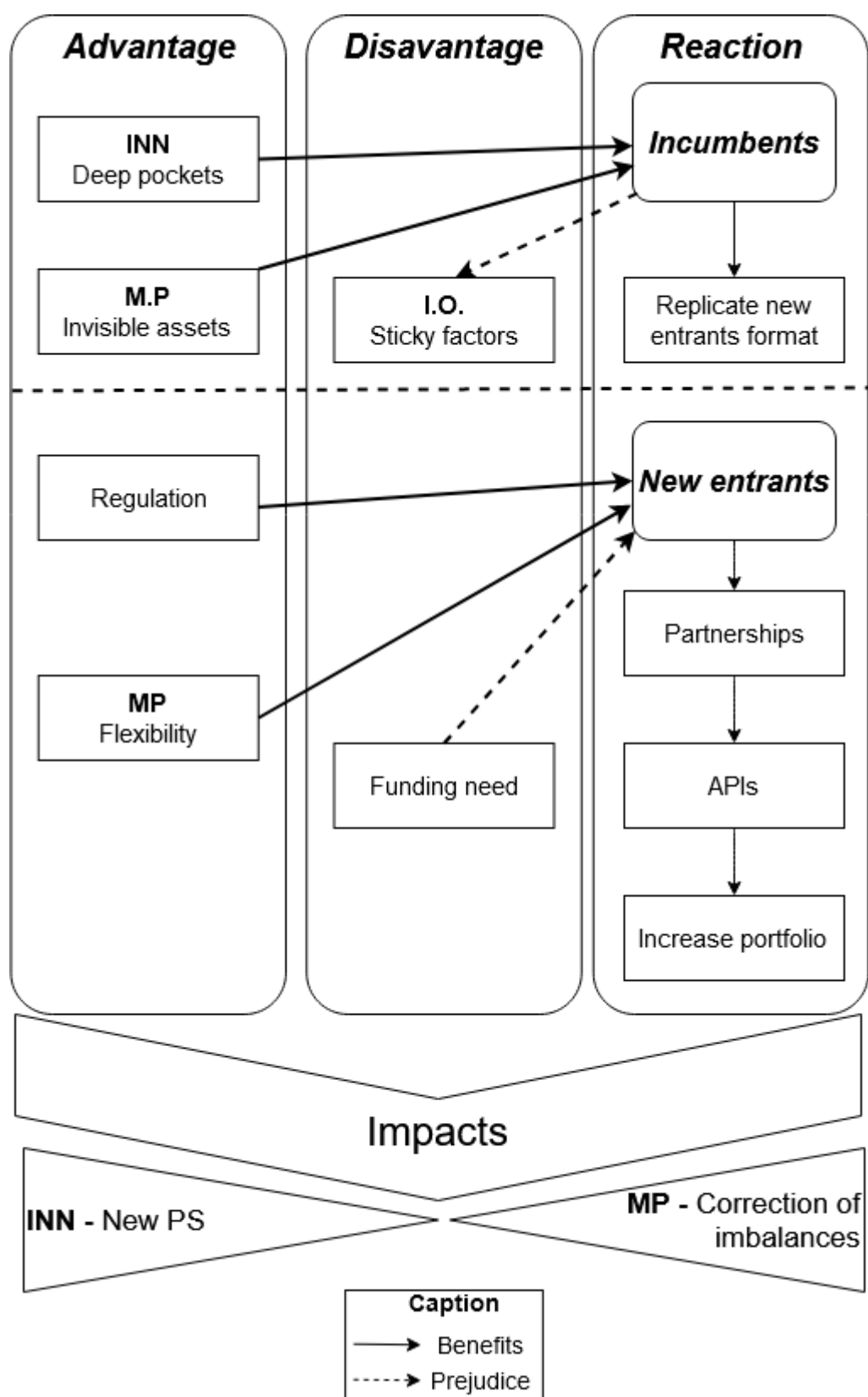
Digitalized and digital banks have difficulties in breaking the barriers to entry. They have a dependence on funding, a current narrow portfolio of PS, and receive legal and market pressures from incumbents. However, their willingness to partnerships can complement their portfolio and increase the funding supply. This funding is viable because digitalized banks can receive checking deposit accounts. Receiving these deposits, they can multiply money and become a source of funding to digital banks.

In a **future** scenario, incumbent banks split their business with their own digitalized and digital banks. Incumbents will increase their portfolio of PS among companies of the same economic groups, avoiding the need of share their APIs. The transference of operations from incumbents to their new banks can reduce their power market and reduce the maintenance costs of their sticky factors (e.g., operational costs).

Digitalized and digital banks, in turn, break the barriers to entry with partnerships and favorable legislation. As a result, they increase their portfolios with APIs, and have more funding to carry out their operations; leveling their competitive position compared to incumbent banks.

The reduction of concentration among banks, market imbalances, and the barriers to entry are the general consequences to the banking industry.

FIGURE 81 –THEORETICAL ELEMENTS AMONG INCUMBENT BANKS AND NEW ENTRANTS



SOURCE: The Author (2020)

Figure 81 shows essential elements when analyzing competition between incumbents and new entrants (in this work represented by digitalized and digital banks) in the banking industry.

At first, sticky factors adversely impact incumbent banks. These banks will reduce this factor through time using the power of their deep pockets. Deep pockets, an element from innovation theory, support incumbents to compete with digitalized and digital banks by opening their own similar companies in the same economic group. The competitive reactions of incumbents occur to protect their invisible assets (e.g., information), an asset built over decades of experience in the market.

New entrants, in turn, present funding problems when compared to incumbent banks. However, regulators tend to protect new entrants (mostly small and medium companies) to stimulate the competition in the market and benefit the customers. Flexibility also helps new entrants when compared with incumbents. The joint actions of new entrants, establishing partnerships among themselves using APIs, allow them to increase their portfolio of PS.

Consequently, all these theoretical elements increase the number of PS in the market and help reducing imbalances. It happens due to the reduction in information asymmetry of information resulting from partnerships.

Managers can analyze how these elements are interacting in the market for predicting their future actions. For an incumbent bank manager, deep pockets can fix most of the issues regarding IT, for example. However, these banks need to stay alert to protect their invisible assets. For example, information about clients is one of these types of assets that can be available in the market with the open banking in the future. One way to create barriers to entry and protect their invisible assets is by reducing the access of third parties to their APIs.

Another perspective for managers is to think about how to compete with flexible new entrants using large organizational structures. We show in the present work that some incumbents invest in digitalized and digital banks or create their own companies. These actions allow them to keep their market share as incumbents and compete for new market shares created by new entrants. However, managers need to avoid using the same legacy systems of incumbent banks in their new companies.

Managers of digitalized and digital banks already show a willingness to establish partnerships between their companies. Although these new entrants are sometimes short of funding, they can gather the profits from partnerships by adding

PS from other companies in their portfolios. Digital banks also can enjoy future favorable regulations to use information from third parts. Information from clients of other banks, for example, is an asset hard for new companies to acquire. This type of information can reduce the risk of credit and interest rates, even for new clients.

7.4 RESEARCH LIMITATIONS

The first limitation is the scope of the companies we analyze, traditional banks (named incumbents), digital banks, and digitalized banks. It is not about all types of FinTechs.

The second limitation relies on the fact that digitalized and digital banks are new types of financial companies. Then, while these companies present themselves as a research opportunity, it is also a problem because the subject has not a solid foundation to serve as analysis and comparison. Besides, the recent appearance of these companies can affect analysis related to mature companies, such as the evolution of historical financial performance.

The third limitation is that media depends on paid announcements. It may result in more news about incumbents because they are big advertisers. It is a limitation as we used newspapers report as secondary information sources.

7.5 FUTURE RESEARCHES

We suggest other researches about different kinds of Fintechs. These researches may follow the structure and methodology of this thesis to collate incumbent banks with Credit and Investment Fintechs to look for threats and advantages in each category of new technological finance companies.

Another interesting investigation path is to look for the balance of financial products and services offered by incumbent banks, digitalized, and digital banks after two or five years. Was our framework reliable?

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APPENDIX A - FINTECHS CATEGORIZATION MODEL OF ANALYSIS (FTCMA)

FinTechs literature presents a considerable number of categories of PS, which convert it in a blurry issue and a Pandora's box (GROMEK, 2018). As a result of this, neither all of these categories can not be used to analyze the competition between the PS offered by incumbent, digital, and digitalized banks and FinTechs.

In order to adopt a common categorization, we create a FinTechs Categorization Model of Analysis (FTCMA) to compare the PS offered by incumbent, digital, digitalized banks, and FinTechs. We start with the methodology, followed by content analysis, qualitative and quantitative data analysis, analysis of categories, and finalize with a overview about the results.

Research Methodology

In this section, we demonstrate how we converted the qualitative data resulting from the five-phased cycle Yin (2016) to the clusters of FinTechs categories in the Gephi Software and the resulting classification of the five biggest Brazilian incumbents banks PS according to these clusters.

The use of these qualitative and quantitative data frames the present work in the Mixed Methods Approach (CRESWELL, 2010). This approach proves to be useful because of combine elements from the content analysis and modularity/clustering analysis, consequently qualitative and quantitative methods of research.

The qualitative and quantitative analysis took eight stages, involving content analysis, data collect, and cluster analysis, as can be seen in Figure 82.

FIGURE 82 – RESEARCH DESIGN STEPS

Stage	Description	Stage Name
1	In the FinTechs' literature, use the context analysis to search for the available categories of FinTechs.	Compile FinTechs Categories
2	Disassemble the composite FinTechs categories to different terms, for example, from "Asset Management and Personal Finance" to "Asset Management" to "Personal Finance".	Disassembly of FinTechs Categories
3	Convert similar terms that represents the same meaning to a common word. Examples include: investments -> investment; cryptocurrencies -> cryptocurrency; and crypto -> cryptocurrency.	Terms' conversion
4	Create keywords for each one of the disassembled FinTechs categories based on the content analysis of the FinTechs categories already existent in the literature.	Keywords
5	Insert the data of FinTechs disassembled categories and their related keywords using the Force Based Atlas Algorithm of the software Gephi to create clusters of new categories according to the distance among the terms.	Reassemblage of New FinTechs Categories
6	Analyze the resulting categories from the "New Categories Creation" stage looking for inconsistencies and divergent categories generated by the software.	Data Analysis
7	In the Brazilian banks context, collect data from the products and services of the five biggest banks from the table of banking fees, banks websites, and official institutions regulations.	Banks PS Data
8	Label the banks' products of the stage "Banks Products Categories" according to the standard categories of the stage "New Categories Creation" looking for a common standard.	Banks Products Categorization

SOURCE: The Author (2020)

Content Analysis

The content analysis is defined as “the systematic analysis of the content of a text (e.g., who says what, to whom, why, and to what extent and with what effect) in a quantitative or qualitative manner” (BHATTACHERJEE, 2012, p. 115). Based on the results of the categories obtained from the cluster analysis and the explanations of the categories already existent in the literature, we use this method to categorize banking PS. Content analysis can be seen in the study of FinTechs (Milian et al., 2019), innovation (Baregheh et al., 2009), and competitive advantage (YOUNG et al., 1996).

Based on the results of the content analysis, we realize the categorization. This process is defined as a “classification operation of constitutive elements of a set, by differentiation and, after this, by regrouping according to the gender (analogy), with the previously defined criteria” (BARDIN, 2002). The author suggests that we can use common characteristics to group the items and that the criteria can be semantic when performed by thematic categories.

We use these definitions and processes to reinforce and justify the steps that we adopt in the analysis of the already existent categories and their definitions. Therefore, the content analysis and the categorization were used jointly with the

literature review concerning the documents that contain and explain the FinTechs categories.

Qualitative Data Analysis

We used the five-phased cycle Yin (2016) to analyze qualitative data concerning FinTechs categories. Besides, we also incorporate some of these steps in the final analysis in order to enhance the data and categories discrimination and disassembly.

According Yin (2016), the collecting method results from a formal search or retrieval procedure from the electronic bibliographic searches. Although we can find some of these items in the field, most of them can come from other sources, as library archives, electronic sources, and websites. The author also suggests that these objects can produce a variety of data (e.g., verbal, numeric, and graphic) about the physical/social environment or even about things not directly observable. The five-phased cycle (Yin, 2016) is detailed in Figure 83:

Figure 83 – Five-phased cycle to analyze qualitative data

Step	Description
<i>Compiling</i>	Formally arranging all the notes in some useful order. The completed compilation might be considered a dataset
<i>Disassembling</i>	Breaking down the compiled data into smaller fragments or pieces, which may be considered a Disassembling procedure. The procedure may (but does not have to) be accompanied by your assigning new labels, or “codes,” to the fragments or pieces
<i>Reassembling (and Arraying)</i>	The rearrangements and recombinations may be facilitated by depicting the data graphically or by arraying them in lists and other tabular forms
<i>Interpreting</i>	Using the reassembled material to create a new narrative, with accompanying tables and graphics where relevant, that will become the key analytic portion of your draft manuscript
<i>Concluding</i>	It calls for drawing the conclusions from your entire study. Such conclusions should be related to the interpretation in the fourth phase and through it to all the other phases of the cycle

SOURCE: Yin (2016, p. 257-258)

Even though the suggested method consists of these five steps, the phases can be recursive, and they do not follow a linear sequence. In this way, the author adds that the researcher can go backward and forward at the same time without compromising on the final results of the collect and data analysis stages.

Quantitative Data Analysis

In this section, we detail how we use the five-phased cycle suggested by Yin (2016) illustrated in Figure 83 to analyze and prepare the FinTechs categories obtained from the literature to the cluster analysis.

The first step of the FinTechs categorization, the compiling, consists of the identification of the categories already existent for these types of companies. We base this step on the literature review, where we found 13 documents (including scientific papers and institutional documents) containing 114 FinTechs categories (98 without duplicates). We perform these procedures in the MS Excel software. It is timely to add that not all of these documents provide some kind of explanation about categories characteristics, or examples of companies in each category.

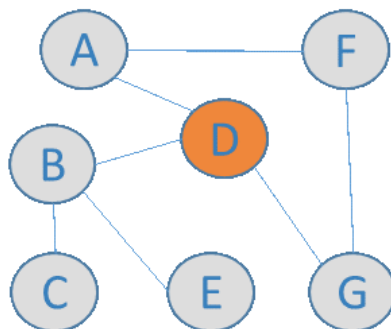
The second step, the disassembling, consisted of split one specific category in two or more. One example of this occurred with the Personal Finance and Asset Management category, which we split in “Asset Management” and “Personal Finance” categories. We did this to improve the power of discrimination among different categories in the future stages. At the end of this process, the dataset contained 142 categories, considering the repetition of some terms.

In the third step, we search for similar terms and adapt them to general terms with the same meaning. Some examples included the conversion of the category investments to investment and cryptocurrencies to cryptocurrency. Even after this process, we keep the repeated categories because this repetition allows the identification of the importance and the weights of these categories.

Based on this new classification and the content analysis from FinTechs literature, in the fourth step, we attribute keywords to each one of these new categories. To exemplify, to the “lending” category, we attribute the keywords “Financing”, “Crowdfunding”, “Factoring”, “Borrow”, “Credit Working capital”, and “Peer-to-peer lending”. We attribute these keywords according to the characteristics and the related categories found in the literature. At the end of this step, the dataset contained 589 keywords related to the new 142 categories that resulted from the second step. Using the categories and the keywords from the previous steps, the fifth step consisted in the development of the new FinTechs categories. We performed this process in the software Gephi (Bastian et al., 2009). The Gephi is open-source software for network analysis that also generates some statistics related to all types of networks, modularity, and clustering analysis.

The nodes and edges are the most critical components of the networks. In the present work, each node represents a specific category and its size is directly related to its length: the more often each category is cited in the literature, the larger the size node. Moreover, the edges are the lines that represent the links between the categories through their related keywords, as we observe in Figure 84.

FIGURE 84 – EXAMPLE OF NODES (“A, B, C, D, E, F,”) AND EDGES (BLUE LINES)



SOURCE: Cherven (2015)

The software Gephi allows working with two different but complementary tools to analyze data. The first is the layout algorithms. In the present work, we select the algorithm ForceAtlas2 (JACOMY et al., 2014). It is a force-directed layout that simulates a physical system in order to spatialize a network. Although, this algorithm is not deterministic and the coordinates of each point do not reflect any specific variable. Then, by contrast with the clustering analysis, the result can not be read as a Cartesian projection (JACOMY et al., 2014).

The other tool available in the Gephi is the modularity clustering. According to Blondel et al. (2008, p. 2), “*modularity of a partition is a scalar value between -1 and 1 that measures the density of links inside communities as compared to links between communities*”. If we compare these two tools, “clusterings and layouts complement each other as representations for the community structure of networks” Noack (2009, p. 5). Then, both of these representations partition the vertex (nodes) into disjoint subsets, placing them at nearby positions or in the same cluster, reflecting the community structure. The modularity also can be seen as a quality index for clusterings (Brandes et al., 2008).

Different algorithms can be used to calculate the cluster and group the nodes of a network in line with distinct clusters. The Gephi uses the Blondel et al. (2008) algorithm, a heuristic method based on modularity optimization used in the large

networks' analysis from the decomposition of the networks into sub-units or communities. Then, this method groups a specific cluster to each one of the nodes of the network, without the mandatory need to analyze separately the allocation of these nodes, as occurs in the cluster analysis, for example. In the sixth step, we search for inconsistencies in the structures of the clusters looking for errors or other problems that could prejudice the classification.

In the seventh step, we build a Brazilian bank PS portfolio of the five biggest incumbent banks measured by assets. As sources, we used the banks' fees table and documents from regulators BACEN, the ANBIMA, and *the Superintendência de Seguros Privados* (SUSEP). We found others PS not covered by these regulators in the own banks' websites. Figure 85 presents the sources of banking PS concerning categorization.

FIGURE 85 - BANKING PRODUCTS AND SERVICES AND THEIR RESPECTIVE SOURCES

Name	Source	Definition
Bank fees table	Banks, based on the 3.919 and 4.196 BACEN and National Monetary Council Resolutions'	The PS classification based in a mandatory and public document published by the banks that entails the maximum fees that their charge for their PS
Lending and financing	BACEN document 3050 and Circular nº. 3.870	Demonstrate the classification of the lending and financing operations, in line with the BACEN classification.
Web Sites	Banks	Information retrieved from the banks' websites and not available from the other documents/resources
Consortium	Circular 3.394 BACEN	Some Brazilian banks also offer consortium quotas for consumer and corporate clients, similar to goods financing operations.
Investment funds classification	ANBIMA	Available investment funds according to a Brazilian market investment funds classification related to their characteristics of assets, duration, risks, and management styles and strategies

SOURCE: The Author (2020)

The choice of the five biggest banks by assets and the websites as sources for some of the PS was based on Oliveira; Von Hippel (2011).

Finally, on the eighth step, we use the characteristics, explanations, and examples of the FinTechs categories from the literature to classify the 157 banks PS (seventh step) according to the new categories generated in the fifth step.

Analysis of categories

The numbers of categories in the works from the literature vary from four to 20, depending on the source. In the first step (compilation), we found 114 categories from the literature (98 without duplicates), that we converted to 142 after the second

step (disassembly). Although we found some repeated categories, we maintain these repetitions because the more often they appear in the literature, the higher their weight and relevance on the final results. In Table 53 we resume these quantities of categories and their respective sources:

TABLE 53 – FINTECHS CATEGORIES FROM THE LITERATURE

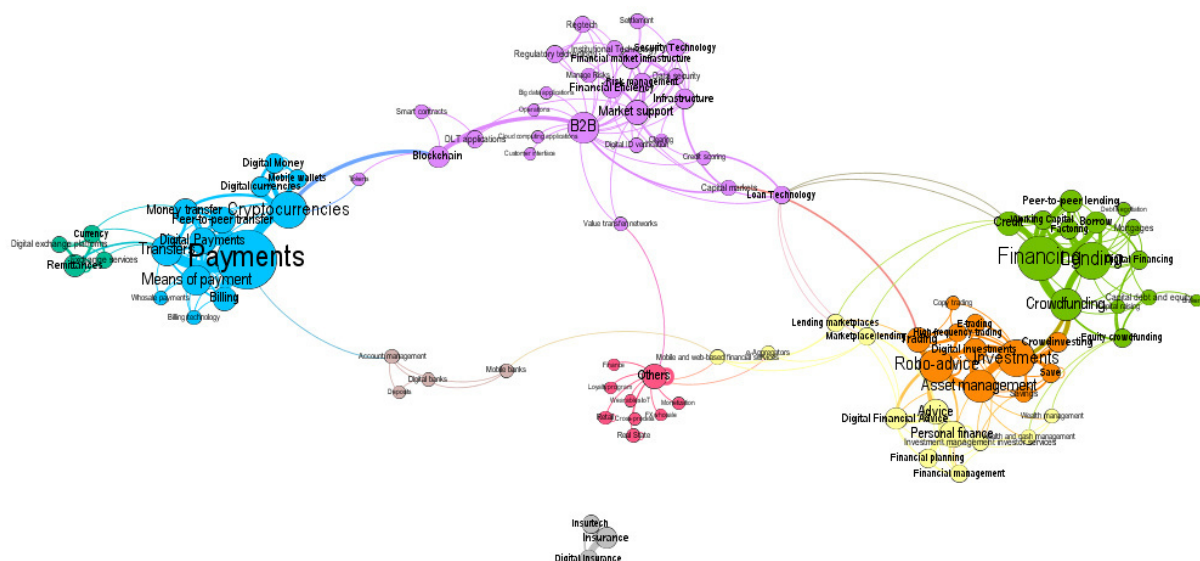
<i>Document source</i>	Categories	
	Initial	After disassembly
<i>ABFintechs; SEBRAE (2018)</i>	11	14
<i>Arner et al. (2015)</i>	5	9
<i>BCBS (2018)</i>	14	14
<i>CBI Insights (2019)</i>	10	14
<i>Dorfleitner et al. (2017)</i>	4	4
<i>FSB (2017)</i>	20	26
<i>Gimpel, Rau, & Röglinger, 2017</i>	11	16
<i>Gomber (2017)</i>	6	6
<i>He et al. (2017)</i>	5	5
<i>Hornuf & Haddad, 2019</i>	9	9
<i>Gromek (2018)</i>	5	6
<i>Milian, Spinola, & Carvalho, 2019</i>	8	13
<i>Puschmann (2017)</i>	6	6
<i>Total</i>	114	142

SOURCE: The Author (2020) based on the literature review

Then, after the third step (terms conversion), we attributed keywords to each one of these categories (fourth step), represented by the own names of the categories plus other four terms found in the literature that we did not found before as categories (brokerage, mortgages, factoring, and working capital). At the end of this process, these keywords totalized 778 terms.

Using the Gephi software, in the fifth step we input these categories and keywords data to generate a network and calculate the subsequently statistical data concerning the clusters. The results calculated by the modularity algorithm created by Blondel et al. (2008) generated nine categories connecting the categories and their related keywords. Using the Force Atlas 2 layout mode Jacomy et al. (2014) and the already cluster algorithm, we displayed the resulting network composed of 98 nodes and 283 edges in Figure 86.

FIGURE 86 – LAYOUT OF FINAL CATEGORIES GENERATED BY GEPHI



Note: Force Atlas 2 Parameters

Tolerance Speed	Approximation	Scaling	Approximate Repulsion	Prevent Overlap	Edge Weight Influence
1.0	2.0	10.0	Yes	Yes	1.0

SOURCE: The Author (2020)

As illustrated by the Figure 86, the Force Atlas 2 algorithm segment and designed the networks in a way that allows the comprehension of the distance among the clusters. Otherwise, the division of the modularity algorithm generates nine different clusters, represented by the different colors of the network.

This process generates nine clusters of the FinTechs categories that, according to their elements and the content analysis of the selected literature, we call as: Payments and Transfers; Exchange; Lending; Insurance; Investments; Advice; B2B; Digital Banks; and Others. We detail the components of each one of these categories in Figure 87.

FIGURE 87 – NINE CATEGORIES OF FINTECHS AND THEIR COMPONENTS

Category	Components
Advice	Digital Financial Advice; e-Aggregators; Financial management; Financial planning; Investment management investor services; Lending marketplaces; Marketplace lending; Mobile and web-based financial services; Personal finance; Wealth and cash management; Wealth management
B2B	B2B; Big data applications; Blockchain; Capital markets; Clearing; Cloud computing applications; Credit scoring; Customer interface; Data security; Digital ID verification; DLT applications; Financial Efficiency; Financial market infrastructure; Infrastructure; Institutional Technology; Loan Technology; Manage Risks; Market support; Operations; Regtech; Regulatory technology; Risk management; Security Technology; Settlement; Smart contracts; Tokens; Value transfer networks
Digital banks	Account management; Deposits; Digital banks; Mobile banks
Exchange	Currency; Digital exchange platforms; Exchange services; Remittances
Insurance	Digital Insurance; Insurance; Insurtech
Investments	Asset management; Copy trading; Crowdfunding; Digital investments; E-trading; High-frequency trading; Investments; Robo-advice; Save; Savings; Trading
Lending	Borrow; Brokerage; Capital debt and equity; Capital raising; Credit; Crowdfunding; Debt Negotiation; Digital Financing; Equity crowdfunding; Factoring; Financing; Lending; Mortgages; Peer-to-peer lending; Working Capital
Others	Cross-process; Finance; FX wholesale; Loyalty program; Monetization; Others; Real State; Retail; Wearables IoT
Payments and transfers	Billing; Billing technology; Cryptocurrencies; Digital currencies; Digital Money; Digital Payments; Means of payment; Mobile wallets; Money transfer; Payments; Peer-to-peer transfer; Transfers; Wholesale payments

SOURCE: The Author (2020)

Table 54 demonstrates some statistics about the structure of the network and the clusters generated by the software Gephi.

TABLE 54 - STATISTICS OF GRAPH AND CLUSTERING

Type of Measure	Settings	Concept	Value
Network measures	Diameter	How many steps are necessary to traverse the graph between the most distant points	10
	Average path length	The shortest possible path between all nodes in the network	4.103
	Connected components	The number of distinct components within the network.	2
	Average diameter	Mean of the diameter steps to traverse the graph	4.103
	Average degree	Typical number of neighbors by node	5.776
	Clustering coefficient	Graph density means the % of the possible graph triangles that are complete	0.5633
Clustering metrics	Clustering coefficient	The average number of closed triangles (triplets) relative to the potential number of triangles available in the network.	0.632
	Modularity	Assess the number of distinct groupings within a network.	0.722

SOURCE: The Author (2020) based on Cherven (2015)

As can be identified in the Table 54, we can highlight the “connected components” value (2) because the division of the “Insurance” category from the rest

of the network and the “modularity” of the value of 0.722 that represents the ability to clusters be distinct between them (between 0 to 1). The sixth step did not generate divergences in the composition of clusters.

Afterward, on the seventh step, we used five different sources shown in Figure 85 and identified 157 different PS offered by the five biggest Brazilian incumbent banks according to the ranking of total assets by BACEN (2018). According to each data source, we demonstrate the results: bank fees table (78); lending and financing (60), banks’ web sites (9); consortium (6); and investment funds classification (4). It is essential to highlight that the five biggest Brazilian banks, *BB Brasil*, *Itaú*, *Bradesco*, *Caixa*, and *Santander*, concentrate 69,3% of the total assets, credit operations, and the total of bank deposits of the Brazilian banking and non-banking segment in 12/2018 (BACEN, 2018).

In the eighth step, we use the nine FinTechs’ categories to classify the 157 incumbent banking PS based on main characteristics and similarities with the already existent FinTechs PS. We displayed the results in Table 55.

TABLE 55 – INCUMBENTS BANKS PRODUCTS AND SERVICES CLASSIFICATION

Category of FinTech	Number of Banking Products and Services
Lending	73
Digital banks	29
Payments and transfers	27
Exchange	14
Investments	8
Insurance	4
Advice	2
Total	157

SOURCE: The Author (2020)

Findings and Overview about Categories

In this section we aim to discuss about the results of the categories analysis and some thoughts about the competitive consequences that the study of FinTechs categories and PS can bring to the Brazilian financial market.

Similarity of categories - Among the 13 documents obtained from the literature, some of them present similarities with the categories generated in the Results section. The three most cited similar categories are Insurance (seven documents), Payments and Transfers (six), and Lending (three).

Digital banks – The digital bank category has some specific features that differ from the others. In a similar way to the traditional banks, this category can encompass

almost all of the items of the other categories, like payments, investments, and lending. The differences rely on the fact that the services offered by these new types of companies are virtual, and not face-to-face, as occurs in the incumbent banks. In the cluster analysis, the clustering algorithm grouped this category separately.

Another essential characteristic that differs digital banks from the other FinTechs is the demand deposit account. As these companies can offer this service, they can use part of these resources to lend to their clients, and, subsequently, multiply the value of these deposits. Even though digital banks are categorized as FinTechs, if they want to provide their services on the Brazilian market, they need to attend the regulation already established to the traditional banks. This is another critical characteristic that needs to be highlighted because they enter a market that already has specific national and international regulations (e.g., the Basel Accord).

BACEN Resolution Nº. 4.553/2017 segments Brazilian financial institutions according to their size and activities offered (S1, S2, S3, S4, and S5). Following this classification, the prudential regulation applied to each institution depends on its impact on the financial system. Thus, as higher the impact and their consequences, the higher the degree of regulation that the institution need to comply with. Since FinTechs are generally smaller than incumbent banks, these new companies are not under the most severe degree of regulation.

Blockchain and cryptocurrencies – From the 13 documents with FinTechs categories, five of them differentiate these categories from the others. Following the idea of FinTechs as a tool not as destination Gromek (2018), the blockchain was placed by the clustering algorithm in the “B2B” category and the cryptocurrencies in the “Payments and Transfers” category.

Despite the specific characteristics of these two categories, the present work keeps this classification because we intend to use these nine final categories to analyze the similarities between the FinTechs and the incumbent banks. Then, at this moment, we consider them as ways to attend already existent customer needs, in the present case the payments/transfer for cryptocurrencies and the support of the cryptocurrencies given by the Blockchain.

B2B Category – On the competition analysis, the customers are the level of analysis of the present work. Then, regardless of the non-existence of a specific “B2B” category in the analyzed literature, we included this keyword in the categories analysis

to split the final PS offered to customers from the services provided by FinTechs to other banks or FinTechs.

Among the 27 categories of this cluster, we can highlight: big data applications; loan technology; regtech; data security; and settlement. We know that some of these categories represent considerable innovations compared to the traditional processes already applied by the incumbent banks. Besides that, they will serve as support and background to PS that meet the traditional needs of the customers (e.g., payments, lending, and investments).

Competition – The banks can adapt their PS in a way that seems similar to the FinTechs or even buy these companies in a competitive market. Besides that, customers can not perceive the difference and, unless the PS do not contain significant differences, as the value transfer without the need of a bank deposit account, the people can be reluctant to change their behavior.

This result can be resulting from the affirmation of Gromek (2018) that FinTechs is a tool, not a destination because the differences between the FinTechs and incumbents banks rely on the processes applied to meet the same customers' needs.

In line with this affirmation, despite the technology applied in the processes, the customers' final needs (destination) are almost immutable. If they do not perceive the differences in efficiency or costs between the traditional or the new products or services, they can be reluctant about their adoption. Then, as the customers always will need to pay their bills, have insurance plans, or make investments, for example, they want advantages to change their behavior.

In this competitive scenario, although the digital banks do not offer a wide-ranging PS portfolio at their beginning, they can be seen as buckets. Then, they are a category that threat the incumbent banks because they can bundle other categories of FinTechs as payments, lendings, insurance, and investments. Therefore, if these institutions can offer similar PS at low prices or in a more efficient way, the customers can perceive this completeness and change their habits to this new type of companies.

Some new technologies change some PS in a way that the incumbent banks do not have options yet. Examples are the P2P technologies to lending or transfers, that allow financial transactions without the need of a bank acting as a third participant. In the P2P lending, for example, people can lend and borrow money without the need

of a bank to fund the operation. In this case, the lender acts as an investor and without the need of a bank, earning interest rates paid by the borrower.

Although the innovation enables the FinTechs to bring some new PS, it is essential to emphasize that, most of the times, the FinTechs are just a tool to solve traditional problems faced by the bank customers. Then, even though these new companies look like a robust competitive player, the adoption by the customers will depend on different characteristics beyond the innovation offered by these companies.

This study let us offer a framework that can be applied in different countries. However, specific issues regarding the structure of bank portfolios may vary by country in terms of regulation and institutional structure. Therefore, an application of this framework to other countries and the incorporation of different elements (e.g., innovation degree, extension of portfolio, or customer adoption) are useful future avenues of research.

APPENDIX B - SOURCES OF MARKET LAUNCH DATE OF PRODUCTS AND SERVICES

Date	Source
03/30/2020	https://www.bancointer.com.br
03/30/2020	https://www.agibank.com.br/
04/01/2020	https://www.bcb.gov.br/
04/01/2020	https://www.bancobs2.com.br
04/01/2020	https://www.bancodigimais.com.br/
04/01/2020	https://www.bancobs2.com.br/wp-content/uploads/2019/06/Pessoa-fi%CC%81sica-Vige%CC%82ncia-a-partir-de-16_11_2018.pdf
04/02/2020	https://www.c6bank.com.br/files/tabela-de-tarifas.pdf
04/02/2020	https://www.c6bank.com.br/files/fundos-de-investimento-renda-fixa.pdf
04/02/2020	https://www.c6bank.com.br/documentos/
04/02/2020	https://www.c6bank.com.br/nossos-produtos
04/02/2020	https://ajuda.modalmais.com.br/hc/pt-br/articles/360015552573-Quais-s%C3%A3o-as-taxas-e-tarifas-do-Banco-Digital-
04/02/2020	https://www.modalmais.com.br/investimentos
04/02/2020	https://www.modalmais.com.br/cartoes/classic?utm_source=google&utm_medium=search&utm_campaign=lead_cartao-classic&utm_content=cartao-classic&utm_term=keywords&gclid=Cj0KCQjwmpb0BRCBARIsAG7y4zbO7ldBr0nsgy5OLvkT7msGiKlID-kYNFKI2yUZSpXC5MPojCp5kOEaAIQyEALw_wcB
04/02/2020	https://www.sofisadireto.com.br/duvidas/
04/02/2020	https://www.sofisadireto.com.br/cartao-sofisa-direto/
04/02/2020	https://www.pernambucanas.com.br/conta-digital; https://pnbcommerceimages.s3.amazonaws.com/Pdfs/1067912_AFC_Conta_Digital_FAQ_01_20.pdf
04/02/2020	https://pnbcommerceimages.s3.amazonaws.com/Pdfs/1067912_AFC_Conta_Digital_FAQ_01_20.pdf
04/06/2020	https://faqs.socialbank.com.br/hc/pt-br/sections/360006963333-Perguntas-Frequentes
04/06/2020	https://www.hugpay.com.br/index.html
04/07/2020	https://banqi.com.br/tarifas
04/30/2020	https://banco.bradesco/assets/classic/pdf/nova-vigencia/ativas/Cesta-Next.pdf
04/30/2020	https://next.me/documentos-importantes
04/30/2020	https://next.me/_/assets/pdfs/propostas_de_cesta_de_servicos.pdf
04/30/2020	https://cms.santander.com.br/sites/WPS/documentos/arq-sustentabilidade-produtos-finan-conheca-lista-1-conteudo/18-12-21_153905_educacao-financeira_tipos-contas.pdf
04/30/2020	https://cms.santander.com.br/sites/WRI/documentos/url-fato-venda-superdigital/20-02-28_210451_fato%20relevante%20santander_venda_super.pdf
04/30/2020	https://superdigital.zendesk.com/hc/pt-br/articles/360018930011-D%C3%A1-para-ver-o-extrato-no-caixa-eletr%C3%B4nico-

SOURCE: The Author (2020)

APPENDIX C - LIST OF CODES OF QUALITATIVE ANALYSIS

(Continue)

Code name	Magnitude	Group	Type	Emergent
<i>Digitalization of older banks</i>	173	Action	Context	Yes
<i>Incumbent actions</i>	103	Action	Context	Yes
<i>Other banks actions</i>	12	Action	Context	Yes
<i>Partnerships</i>	124	Action	Context	Yes
<i>Acquisition</i>	8	Action	Context	No
<i>Merger</i>	0	Action	Context	No
<i>Banco do Brasil</i>	98	Banks	Context	Yes
<i>Bradesco</i>	95	Banks	Context	Yes
<i>Caixa</i>	15	Banks	Context	Yes
<i>Digital banks</i>	93	Banks	Context	Yes
<i>Itaú</i>	59	Banks	Context	Yes
<i>Santander</i>	40	Banks	Context	Yes
<i>Examples from other countries</i>	24	Context	Context	Yes
<i>Justification of research</i>	3	Context	Context	Yes
<i>Analysis</i>	169	Context	Context	No
<i>Concentration</i>	23	Context	Context	No
<i>Description</i>	50	Context	Context	No
<i>Future outlook</i>	135	Context	Context	No
<i>Past Actions</i>	48	Context	Context	No
<i>Adjacent activities</i>	47	Financial Innovation	Data	No
<i>Bank tech</i>	1	Financial Innovation	Data	No
<i>Banking of people</i>	24	Financial Innovation	Data	Yes
<i>Bigtechs</i>	17	Financial Innovation	Data	Yes
<i>Broad portfolio of PS</i>	11	Financial Innovation	Data	Yes
<i>Credibility of digital banks</i>	8	Financial Innovation	Data	Yes
<i>Digital clients</i>	24	Financial Innovation	Data	No
<i>Economies of scale</i>	7	Financial Innovation	Data	No
<i>Enviromental conditions</i>	45	Financial Innovation	Data	No
<i>Exclusion of a third part</i>	9	Financial Innovation	Data	No
<i>Favorable structure of the industry</i>	9	Financial Innovation	Data	No
<i>Fees and rates</i>	22	Financial Innovation	Data	Yes
<i>Incubator / accelerator</i>	28	Financial Innovation	Data	Yes
<i>Inflexibility of incumbents</i>	64	Financial Innovation	Data	No
<i>Information assimetry</i>	26	Financial Innovation	Data	No
<i>IT</i>	28	Financial Innovation	Data	No
<i>Legacy systems</i>	10	Financial Innovation	Data	Yes
<i>Lower costs</i>	36	Financial Innovation	Data	No
<i>Narrow portfolio</i>	5	Financial Innovation	Data	Yes
<i>New PS</i>	119	Financial Innovation	Data	Yes
<i>Open banking</i>	67	Financial Innovation	Data	Yes
<i>Reduced transaction costs</i>	9	Financial Innovation	Data	No
<i>Social networks</i>	18	Financial Innovation	Data	No
<i>Taxes and regulations</i>	63	Financial Innovation	Data	No

Code name	Magnitude	Group	Type	Emergent
Technological opportunity	69	Financial Innovation	Data	No
White label digital bank	4	Financial Innovation	Data	Yes
FinTechs	88	Financial Innovation	Data	Yes
Disruptive innovation	6	General Innovation	Data	No
General innovation	5	General Innovation	Data	Yes
Incremental innovation	20	General Innovation	Data	No
Low entry barriers	15	General Innovation	Data	No
Perceived innovation	11	General Innovation	Data	No
Pioneerism	11	General Innovation	Data	No
Technology dependency	31	General Innovation	Data	Yes
User needs	113	General Innovation	Data	No
Barriers to entry	50	Industrial Organization	Data	No
Buyers	0	Industrial Organization	Data	Yes
Differentiation	9	Industrial Organization	Data	No
Extended rivalry	32	Industrial Organization	Data	No
Focus	18	Industrial Organization	Data	No
Game theory	1	Industrial Organization	Data	No
Generic competitive strategies	0	Industrial Organization	Data	No
Low Cost	10	Industrial Organization	Data	No
New entrants	87	Industrial Organization	Data	Yes
New industry	1	Industrial Organization	Data	No
Positioning	16	Industrial Organization	Data	No
Rivalry among competitors	32	Industrial Organization	Data	Yes
Sticky factors	45	Industrial Organization	Data	No
Strategic Groups	0	Industrial Organization	Data	No
Substitute PS	10	Industrial Organization	Data	Yes
Suppliers	2	Industrial Organization	Data	Yes
Switching costs	4	Industrial Organization	Data	No
Correction of imbalances	43	Market Processes	Data	No
Creative destruction	0	Market Processes	Data	No
Durability - Break barriers to entry	25	Market Processes	Data	No
Durability - Cost Quality Advantages	3	Market Processes	Data	No
Durability - Deep pockets	24	Market Processes	Data	No
Durability - Timing / Know How	1	Market Processes	Data	No
Entrepreneurial rents	0	Market Processes	Data	No
Flexibility	51	Market Processes	Data	No
Imperfect information	7	Market Processes	Data	No
Investment in digital companies	19	Market Processes	Data	Yes

Code name	Magnitude	Group	Type	Emergent
<i>Invisible assets</i>	15	Market Processes	Data	No
<i>Sustainable competitive advantage</i>	3	Market Processes	Data	No
<i>Negative</i>	66	Reaction	Context	No
<i>Neutral</i>	13	Reaction	Context	No
<i>Positive</i>	134	Reaction	Context	No
<i>Strong</i>	0	Reaction	Context	No
<i>Weak</i>	0	Reaction	Context	No
<i>APIs</i>	40	Resources and tools	Data	Yes
<i>Artificial intelligence</i>	9	Resources and tools	Data	Yes
<i>Bank branches</i>	53	Resources and tools	Data	Yes
<i>Blockchain</i>	3	Resources and tools	Data	Yes
<i>Crowdfunding</i>	1	Resources and tools	Data	Yes
<i>Digital resources</i>	17	Resources and tools	Data	No
<i>Human resources</i>	32	Resources and tools	Data	Yes
<i>NFC</i>	4	Resources and tools	Data	No
<i>PIX</i>	13	Resources and tools	Data	Yes
<i>Robo advisor</i>	4	Resources and tools	Data	Yes
<i>Conference call</i>	2	Source	Context	Yes
<i>Valor newspaper</i>	117	Source	Context	Yes
<i>Financial Report</i>	7	Source	Context	No
<i>Newspaper reporter</i>	72	Speaker	Context	Yes
<i>Representatives of FinTechs</i>	25	Speaker	Context	Yes
<i>Association of banks</i>	8	Speaker	Context	No
<i>Association of FinTechs</i>	7	Speaker	Context	No
<i>Financial market analysts</i>	120	Speaker	Context	No
<i>Regulatory agencies (ex. BACEN , CVM)</i>	40	Speaker	Context	No
<i>Rep of digital banks</i>	40	Speaker	Context	No
<i>Rep of incumbent banks</i>	202	Speaker	Context	No
<i>Rep of other banks</i>	25	Speaker	Context	No
<i>Supplier</i>	24	Speaker	Context	No
<i>Digital statistics</i>	114	Statistics	Data	No
<i>Investments IT</i>	20	Statistics	Data	No
<i>Mobile statistics</i>	58	Statistics	Data	No
<i>Other statistics</i>	63	Statistics	Data	Yes
<i>Fees and rates</i>	1	Statistics	Data	No

SOURCE: The Author (2020)

APPENDIX D - LIST OF 125 DOCUMENTS ANALYZED

Nº	Document	Date	Group of documents	Nº of selected quotations
1	Management Discussion and Analysis Report BB 2019	02/10/2020	Financial reports	22
2	Conference call transcript BB 2019	02/14/2020	Conference call	2
3	Individual and Consolidated Financial Statements Santander 2019	01/28/2020	Financial reports	4
5	Conference call transcript 2019 Santander	01/29/2020	Conference call	4
7	Integrated Annual Report 2019 Itaú	02/10/2020	Financial reports	18
8	Management Report 2019 Caixa	02/19/2020	Financial reports	1
9	Performance analysis report 2019 Caixa	02/19/2020	Financial reports	2
10	Integrated annual report Bradesco 2019	05/02/2020	Financial reports	31
11	Abertura de dados de clientes impõe desafio a bancos	01/10/2018	Newspaper article	15
12	Agência bancária, de diferencial a patinho feio	04/06/2019	Newspaper article	10
13	Alta de tarifa de cartão supera inflação	09/11/2019	Newspaper article	6
14	Amarras do setor público dificultam competição, diz BB	10/28/2019	Newspaper article	4
15	Aplicativos prometem ajudar usuário a equilibrar orçamento	01/01/2019	Newspaper article	6
16	Aposta de gastos menores no setor financeiro	02/18/2020	Newspaper article	8
17	Atendimento é desafio nos bancos digitais	11/30/2019	Newspaper article	10
18	Avanço de fintechs pressiona bancos a melhorar eficiência	07/31/2019	Newspaper article	11
19	Banco ABC abre laboratório de inovação	07/05/2019	Newspaper article	7
20	Banco Central analisa a criação da figura de 'correspondente digital'	04/16/2020	Newspaper article	3
21	Banco controlado pelos donos do Grupo MRV entra com pedido para IPO	02/23/2018	Newspaper article	6
22	Banco desenvolve modelo que oferece agilidade e eficiência	06/20/2018	Newspaper article	4
23	Banco digital acelera expansão e testa fôlego do segmento	06/24/2019	Newspaper article	13
24	Banco digital avança, mas ainda é conta secundária	11/25/2019	Newspaper article	9
25	Banco do Brasil agiliza operações por aplicativos nas redes sociais	05/21/2018	Newspaper article	6
26	Banco Máxima lança plataforma de conta digital	01/23/2019	Newspaper article	4
27	Banco precisa virar 'loja de departamento', vê diretor global da Ipsos	09/14/2018	Newspaper article	6
28	Banco público cobra mais de empresas	05/23/2020	Newspaper article	3
30	Banco terá de abrir dados de produtos a concorrentes	04/02/2019	Newspaper article	3
31	Bancos apostam em plataformas mais amigáveis	01/27/2017	Newspaper article	6
32	Bancos buscam aproximação com estruturas mais ágeis e inovadoras	11/30/2015	Newspaper article	8
33	Bancos começam a abrir sistemas a desenvolvedores	08/15/2017	Newspaper article	5
35	Bancos digitais e tradicionais avançam nas comunidades	01/24/2020	Newspaper article	6
36	Bancos dispõem de R\$ 20 bi para reforço de estruturas	09/25/2019	Newspaper article	9

Nº	Document	Date	Group of documents	Nº of selected quotations
37	Bancos encontram nas fintechs aliadas para ganhar agilidade	12/14/2017	Newspaper article	10
38	Bancos fecham agências e reagem ao avanço digital	07/31/2019	Newspaper article	8
39	Bancos oferecem novos serviços para atender MEIs	12/21/2018	Newspaper article	7
40	Bancos são destaque nas indicações do mês	03/03/2020	Newspaper article	3
41	Bancos tradicionais aceleram processo de digitalização	05/25/2020	Newspaper article	14
42	Bancos veem 'open banking' como opção de melhorar oferta	04/03/2019	Newspaper article	9
43	BB estuda parceria com fintech e nova carreira em tecnologia	01/23/2020	Newspaper article	8
44	BB poderia ser liberado para privatização, diz Novaes	01/30/2020	Newspaper article	4
45	BB Seguridade e Principal criam plataforma digital para previdência	12/01/2017	Newspaper article	4
46	BB terá parceria com fintech para consignado	01/10/2018	Newspaper article	6
47	BB vê 2020 parecido com 2019 e efeito negativo de novo cheque especial	11/28/2019	Newspaper article	3
48	BC ainda estuda como regular 'open banking'	05/17/2018	Newspaper article	6
49	BC avalia proposta dos bancos para crédito com garantia de imóvel	05/19/2020	Newspaper article	4
50	BC conta com 'fintechs' para o microcrédito	12/09/2019	Newspaper article	7
52	BC prepara modelo de 'open banking' para ser implementado já em 2019	10/16/2018	Newspaper article	8
53	BC quer facilitar uso de caixas eletrônicos por cliente de fintechs	12/16/2019	Newspaper article	9
54	BC sonda mercado sobre adiantar pré-estreia do Pix para setembro	06/26/2020	Newspaper article	5
55	BC tem pedidos de 140 instituições para participar do PIX desde o lançamento	05/29/2020	Newspaper article	3
56	BC teme dano à competição com parceria em torno do WhatsApp	06/25/2020	Newspaper article	10
57	Bradesco fechará 10% das agências até fim de 2020	11/01/2019	Newspaper article	9
58	Bradesco prepara seu banco digital independente	06/28/2016	Newspaper article	9
60	Caixa quer 20 milhões de clientes no microcrédito e promete cortar taxas	01/29/2020	Newspaper article	3
61	Campos avança com planos para abrir dados bancários	04/02/2019	Newspaper article	4
62	Cartões sem anuidade ganham mercado	11/07/2018	Newspaper article	9
63	Celular sai na frente na expansão on-line	01/27/2017	Newspaper article	8
64	CMN autoriza fintech a emitir cartão de crédito e a operar com recursos do BNDES	03/26/2020	Newspaper article	4
65	Com estratégia de 'hub' digital, BV tem lucro 16% maior no 4º tri	02/07/2020	Newspaper article	5
66	Conceito de "open banking" entra em pauta	06/14/2017	Newspaper article	6

Nº	Document	Date	Group of documents	Nº of selected quotations
67	Conceito de 'open banking' entra no discurso das instituições	04/01/2019	Newspaper article	5
68	Conta na tela	06/28/2016	Newspaper article	8
69	Contas poderão ser pagas também em banco digital	01/15/2020	Newspaper article	5
71	Crédito consignado tem fôlego para crescer ainda mais em 2020	12/26/2019	Newspaper article	3
72	Crédito cooperativo cresce na contramão do setor bancário	04/07/2018	Newspaper article	3
73	Cresce a disputa por executivos experientes para atuar em fintechs	12/04/2017	Newspaper article	7
74	Crise coloca sob holofotes poder de mercado dos bancos	03/21/2018	Newspaper article	8
75	Datacenters ficam mais sustentáveis	06/16/2018	Newspaper article	5
76	Debate sobre necessidade de regulação esquentada	06/28/2016	Newspaper article	6
77	Desafio das instituições é cultural	06/14/2017	Newspaper article	7
78	Ecossistema bem estruturado eleva chance de sucesso	06/14/2017	Newspaper article	3
79	Em meio à corrida digital, TecBan acelera investimento	07/14/2019	Newspaper article	7
80	Escolha entre empresa digital e analógica divide investidores	09/18/2019	Newspaper article	4
81	Expansão acelerada na base	05/24/2018	Newspaper article	12
82	Fintechs ajudam a complementar cardápio de serviços financeiros	06/20/2018	Newspaper article	10
83	Fintechs crescem e movimentam grande indústria	06/22/2017	Newspaper article	9
84	Fintechs de crédito pedirão agilidade no registro ao BC	09/21/2017	Newspaper article	7
85	Fintechs se saem melhor que bancos de varejo em abertura de conta digital	05/03/2018	Newspaper article	4
87	Fintechs simplificam resgate de benefícios	07/27/2018	Newspaper article	3
89	Fintechs vivem primeiro 'teste de estresse'	03/25/2020	Newspaper article	6
90	Foco em linhas mais rentáveis impulsiona lucro dos bancos	10/28/2019	Newspaper article	4
91	Futuro é digital, mas brasileiro também quer agência bancária	07/01/2019	Newspaper article	4
92	Gestores mostram interesse por oferta do BB	08/23/2019	Newspaper article	4
93	Gigante de tecnologia ameaça bancos	12/11/2017	Newspaper article	7
94	Governo quer diminuir fatia do BB na área de crédito rural	03/25/2019	Newspaper article	3
97	Grandes bancos têm de cortar R\$ 24 bi em custos	01/06/2020	Newspaper article	8
99	Hub, de Wizard, vai entrar na área de vale-alimentação	11/05/2019	Newspaper article	5
100	Instituições financeiras correm atrás do cliente	11/21/2016	Newspaper article	7
101	Instituições tradicionais realizam parcerias para enfrentar concorrência	01/31/2020	Newspaper article	8
102	IRB fecha parceria com C6 para "prêmios que ainda vão existir"	08/06/2018	Newspaper article	3
103	Lazari assume Bradesco entre o ganhador da agência e o futuro digital	03/14/2018	Newspaper article	5

Nº	Document	Date	Group of documents	Nº of selected quotations
104	Lucro de bancos é recorde, mas deve desacelerar em 2020	02/13/2020	Newspaper article	5
105	Lucro do Votorantim cresce e IPO segue no foco	11/06/2019	Newspaper article	3
106	Mais competição não basta para reduzir spread, diz Loyola	03/05/2019	Newspaper article	5
107	Mais de 140 mil pedem portabilidade de salário para contas digitais	20/21/2019	Newspaper article	10
108	Meta é ter 30% da receita total vinda de PagBank em cinco anos, diz PagSeguro	02/28/2020	Newspaper article	4
110	Na ponta dos dedos	01/27/2017	Newspaper article	5
111	Nubank lança 'trava' para dólar em compra no exterior	10/17/2018	Newspaper article	4
112	Nubank pede abertura de processo contra bancos	03/22/2018	Newspaper article	5
113	O mercado de empréstimos para as empresas	01/24/2020	Newspaper article	3
114	O próximo nível	05/21/2018	Newspaper article	9
115	Open banking estimula novos produtos	06/15/2020	Newspaper article	7
116	Open banking reduz brecha para banco dificultar acesso a dado	11/29/2019	Newspaper article	8
118	Pagamento de contas poderá ser feito em bancos digitais	01/14/2020	Newspaper article	6
120	Pagamento instantâneo pode girar R\$ 16 trilhões	06/15/2020	Newspaper article	9
121	PagSeguro e Stone ampliam mercado com novos serviços	08/18/2019	Newspaper article	7
122	PagSeguro quer entrar na disputa pelo crédito	01/21/2019	Newspaper article	10
123	País tem 1ª operação de empréstimo entre pessoas	09/12/2019	Newspaper article	5
124	Pandemia acelera mudança em pagamento	05/07/2020	Newspaper article	9
125	Parceria entre BB e Bradesco, banco CBSS vira Digio	10/08/2019	Newspaper article	7
126	Parcerias com startups aceleram inovação no setor	06/20/2018	Newspaper article	6
127	PicPay lança limite de crédito na conta em parceria com Original	07/25/2019	Newspaper article	5
128	Por que bancos nunca perdem, nem na crise	03/21/2018	Newspaper article	4
129	Por que Guimarães não é (nem deveria ser) exterminador de banco	01/27/2020	Newspaper article	3
130	Portabilidade de salário abre frente de competição com banco	06/29/2018	Newspaper article	9
132	Santander lança plataforma de pagamentos móveis	09/11/2019	Newspaper article	5
133	Santander lança plataforma Pi com devolução de rebate	03/15/2019	Newspaper article	4
134	Setor aguarda sinal para acelerar o open banking	05/24/2018	Newspaper article	6
135	Setor bancário fechou 62,7 mil vagas desde 2013	07/30/2019	Newspaper article	10
136	Setor se arma para ambiente competitivo com open banking	01/30/2020	Newspaper article	7
137	Spread e tecnologia levam bancos a nova fase de corte de custos	06/18/2020	Newspaper article	11

Nº	Document	Date	Group of documents	Nº of selected quotations
139	Tecnologia amplia opções e facilita a vida do investidor	01/27/2017	Newspaper article	5
140	Teles reforçam competição com bancos	01/13/2020	Newspaper article	9
142	Teto para cheque especial foi medida técnica, diz Campos	12/03/2019	Newspaper article	4
143	Um olho no spread, outro na concentração bancária	12/19/2016	Newspaper article	3

SOURCE: The Author (2020)